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AMBASSADOR
INTERNATIONAL ACADEMY
INSPIRE INQUIRE INNOVATE

Maths Scope and Sequence

Strands:

- Number
- Shape and Space
- Pattern and Function
- Measurement
- Data Handling

Number

Conceptual understandings	• 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.

Learning outcomes

Pre-k

When constructing meaning learners:

- Understand one-to-one correspondence
  - Select a small number of objects from a group when asked, for example, 'please give me one,' 'please give me two'.
- 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 whole-part relationships
- Use the language of mathematics to compare quantities, for example, more, less, first, second.

When transferring meaning into symbols learners:

- Connect number names and numerals to the quantities they represent.
  - Recite some number names in sequence.
  - Recite numbers in order to 10.
  - Trace numbers from 1 to 10 in correct formation.
  - Recognises numerals 0 to 10.
  - Match numeral and quantities correctly.

When applying with understanding learners:

- Count to determine the number of objects in a set
  - Begin to represent numbers using fingers, marks on paper or pictures.
  - Realize not only objects, but anything can be counted, including steps, claps or jumps.
- Use number words and numerals to represent quantities in real-life situations
  - Use some number names and number language spontaneously.
  - Use some number names accurately in play.
  - Show an interest in numerals in the environment.
  - Show an interest in representing numbers.
- Use the language of mathematics to compare quantities in real-life situations, for example, more, less, first, second
  - Begin to make comparisons between quantities.
  - Use some language of quantities, such as 'more' and 'lot'.
- Use simple fraction names in real-life situations.

KG1

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 whole-part relationships
- Use the language of mathematics to compare quantities, for example, more, less, first, second.

When transferring meaning into symbols learners:

- Connect number names and numerals to the quantities they represent.
  - Recognise, count, represent and order numbers (1-10)(11-20)(21-30)
  - Recognise the quantities and associates them to the corresponding symbol (1 – 5) (6 – 12) (13 – 20)
  - Record, using marks that they can interpret and explain

When applying with understanding learners:

- Count to determine the number of objects in a set
  - Match objects by one – to – one correspondence (1 – 5) (6 – 12) (13 – 20)
- Use number words and numerals to represent quantities in real-life situations
  - Estimate how many objects they can see and checks by counting them
- Use the language of mathematics to compare quantities in real-life situations, for example, more, less, first, second
  - Say the number that is one more than a given number
  - Find one more or one less from a group of up to five objects, then ten objects
  - Begins to identify and suggest solutions for mathematical problems in different situations
  - Identify and compare sets with more, fewer or the equal number of objects
  - In practical activities and discussion, begins to use the vocabulary involved in adding and subtracting
  - Composes and decomposes numbers up to 10 in variety of context
- Use simple fraction names in real-life situations.

Conceptual understandings	• The base 10 place value system is used to represent numbers and number relationships. • Fractions are ways of representing wholepart relationships. • The operations of addition, subtraction, multiplication and division are related to each other and are used to process information to solve problems. • Number operations can be modelled in a variety of ways. • There are many mental methods that can be applied for exact and approximate computations.

Learning outcomes

KG2

When constructing meaning learners:

- Model numbers to hundreds or beyond using the base 10 place value system
  - Identify and represent numbers using objects and pictorial representations including the number line, and use of language of: equal to, more than, less than (fewer), most, least
- 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
  - Read, write and interpret mathematical statements involving addition (+), subtraction () and equals (=) signs
- 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

When transferring meaning into symbols learners:

- Read and write whole numbers up to hundreds or beyond
  - Read and write numbers from 1 to 20 in numerals and words
  - Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number Count in multiples of 2s, 5s and 10s
- Read, write, compare and order cardinal and ordinal numbers
- Describe mental and written strategies for adding and subtracting two-digit number.
  - Represent and use number bonds and related subtraction facts within 20
  - Add and subtract one-digit and two-digit numbers to 20, including 0
  - Given a number, identify 1 more and 1 less

When applying with understanding learners:

- Use whole numbers up to hundreds or beyond 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
  - Recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity
  - Recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity.
- 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
  - Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? 9
  - Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher
  - Use strategies to evaluate the reasonableness of answers.
  - Recall and use multiplication and division facts for the 2, 5 and 20 multiplication tables, including recognising odd and even numbers.
  - Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs
  - Show that multiplication of 2 numbers can be done in any order and division of 1 number by another cannot.

G1

When constructing meaning learners:

- 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

When transferring meaning into symbols learners:

- Read and write whole numbers up to hundreds or beyond
  - **Recognise** the place value of each digit in a two-digit number (10s, 1s)
  - Read and write numbers to at least 100 in numerals and words
  - Use place value and number facts to solve problems
- Read, write, compare and order cardinal and ordinal numbers
  - **Compare** and order numbers from 0 up to 100; use < , > and = signs
- **Describe** mental and written strategies for adding and subtracting two-digit number.

When applying with understanding learners:

- Use whole numbers up to hundreds or beyond in real-life situations
  - **Identify**, represent and **estimate** numbers using different representations, including the number line
- 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
  - **Recognise**, find, name and write fractions 1/3, 1/4, 2/4 and 3/4 of a length, shape, set of objects or quantity
  - **Represent** simple fractions, for example 1/2 of 6 = 3 and recognise the equivalence of 2/4 and 1/2
- Use mental and written strategies for addition and subtraction of two-digit numbers or beyond in real-life situations
  - Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
  - Add and subtract numbers using concrete objects, pictorial representations, and mentally, including;
    - Two-digit number and 1s
    - a two-digit number and 10s
    - Two-digit numbers
    - adding 3 one-digit numbers
- Select an appropriate method for solving a problem, for example, mental estimation, mental or written strategies, or by using a calculator
  - **Show** that addition of 2 numbers can be done in any order and subtraction of one number from another cannot.
  - **Recognise** and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
  - Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? 9
  - **Solve** one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays and **justify**
  - Recall and use multiplication and division facts for the 2, 5 and 20 multiplication tables, including recognising odd and even numbers.
  - **Calculate** mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs
  - **Show** that multiplication of 2 numbers can be done in any order and division of 1 number by another cannot.
- Use strategies to **evaluate** the reasonableness of answers.

Conceptual understandings	• 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 addition, subtraction, multiplication and division are related to each other and are used to process information to solve problems. • Even complex operations can be modelled in a variety of ways, for example, an algorithm is a way to represent an operation.

Learning outcomes

G2

When constructing meaning learners:

- 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

When transferring meaning into symbols learners:

- Read, write, compare and order whole numbers up to thousands or beyond
  - **Recognise** the place value of each digit in a 3digit number (100s, 10s, 1s)
  - Read and write numbers up to 1,000 in numerals and in words
  - **Compare and order** numbers up to 1,000
  - **Identify**, represent and **estimate** numbers using different representations
- Develop strategies for memorizing addition, subtraction, multiplication and division number facts
- Read, write, compare and order fractions
  - Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10.
- Read and write equivalent fractions
  - **Recognise**, find and write fractions of a discrete set of objects; unit fractions and non-unit fractions with small denominators.
  - **Recognise** and use fractions as numbers; unit fractions and non-unit fractions with small denominators
- Read, write, compare and order fractions to hundredths or beyond
  - Add and subtract fractions with the same denominator within one whole
  - **Compare** and order fractions, and fractions with the same denominators
  - **Solve** problems involving fractions
- Describe mental and written strategies for multiplication and division.

When applying with understanding learners:

- Use whole numbers up to thousands or beyond in real-life situations
  - Add and subtract numbers mentally, including;
    - A three digit number and 1s
    - A three-digit number and 10s
    - A three-digit number and 100s
  - Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
  - **Estimate** the answer to a calculation and use inverse operations to check answers
- Use fast recall of multiplication and division number facts in real-life situations.
  - Recall and use multiplication and division facts for the 3,4 and 8 multiplication tables
  - Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
  - **Solve** problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects
- **Apply** decimal fractions in real-life situations and **justify**
- **Estimate** and Use mental and written strategies for multiplication and division in real-life situations
- Select an efficient 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
- 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.

G3

When constructing meaning learners:

- 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

When transferring meaning into symbols learners:

- Read, write, compare and order whole numbers up to thousands or beyond
  - **Recognise** the place value of each digit in a four-digit number (1,000s, 100s, 10s and 1s)
  - Find 1,000 more or less than a given number
  - Count backwards through 0 to include negative numbers.
  - **Order and compare** numbers beyond 1,000
  - **Identify,** represent and **estimate** numbers using different representations
  - **Round** any number to the nearest 10, 100 or 1,000
  - **Solve** number and practical problems that involve all of the above and with increasingly large positive numbers
  - Read roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of 0 and place value
- Develop strategies for memorizing addition, subtraction, multiplication and division number facts
- Read, write, compare and order fractions
  - Recognise and show, using diagrams, families of common equivalent fractions
  - Count up and down in hundredths; recognise that hundredths arise when dividing an object by a 100 and dividing tenths by 10
  - Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
  - Add and subtract fractions with the same denominator
- **Represent** and write equivalent fractions
- Read, write, compare and order fractions to hundredths or beyond
  - Recognise and write decimal equivalents of any number of tenths or hundredths
  - **Recognise** and write decimal equivalents to ¼, ½, ¾
- Describe mental and written strategies for multiplication and division.

When applying with understanding learners:

- Use whole numbers up to thousands or beyond in real-life situations
  - Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
  - **Estimate** and use inverse operations to check answers to a calculation
  - Solve addition and subtraction twostep problems in contexts, deciding which operations and methods to use and why.
- Use fast recall of multiplication and division number facts in real-life situations.
  - Recall multiplication and division facts for multiplication tables up to 12 x 12
  - Use place value, know and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers
- Use decimal fractions in real-life situations
  - Find the effect of dividing a one or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.
  - **Round** decimals with 1 decimal place to the nearest whole number
  - **Compare** numbers with the same number of decimal places up to 2 decimal places
  - Solve simple measure and money problems involving fractions and decimals to 2 decimal places.
- Use mental and written strategies for multiplication and division in real-life situations
- Select an efficient 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
- Add and subtract fractions with related denominators in real-life

Phase 4

Conceptual understandings	• The base 10 place value system extends infinitely in two directions. • Fractions, decimal fractions 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 a comparison of two numbers or quantities.

Learning outcomes

G4

When constructing meaning learners:

- 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.

When transferring meaning into symbols learners:

- Read, write, compare and order whole numbers up to millions or beyond
  - Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
  - **Interpret** negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through 0
  - **Round** any numbers up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100, 000
  - **Solve** number and practical problems that involve counting, estimating, ordering and comparing
  - Read roman numerals to 1,000 (m) and recognise years written in roman numerals
- Read and write ratios
- Read and write integers in appropriate contexts
- Read and write exponents and square roots
- **Convert** improper fractions to mixed numbers and vice versa
- **Simplify** fractions in mental and written form
  - Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.
  - **Compare** and order fractions whose denominators are all multiples of the same number
  - **Identify**, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
  - Add and subtract fractions with the same denominator and denominators that are multiples of the same number
  - Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
  - Read and write decimal numbers as fractions
- Read, write, compare and order decimal fractions to thousandths or beyond
  - **Recognise** and use thousandths and relate them to tenths, hundredths and decimal equivalents
  - **Round** decimals with 2 decimal places to the nearest whole number and to 1 decimal place
  - Read, write, order and compare numbers up to 3 decimal places
  - Solve problems involving numbers up to 3 decimal places
- Read, write, compare and order percentages
  - **Recognise** the per cent symbol (%) and understand that per cent relates to "number of parts per 100" and write percentages as a fraction with denominator 100, and as a decimal fraction
  - Solve problems which require knowing percentage and decimal equivalents of ½, ¼, 1/5, 2/5, 4/5 and fractions with a denominator of a multiple of 10 or 25
- **Convert** between fractions, decimals and percentages.

When applying with understanding learners:

- **Classify and Use** whole numbers up to millions or beyond in real-life situations
  - Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
  - **Estimate** and Add and subtract numbers mentally with increasingly large numbers
  - **Estimate** and Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
  - Solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why
  - **Analyse and identify** multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.

G5

When constructing meaning learners:

- 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.

When transferring meaning into symbols learners:

- Read, write, compare and order whole numbers up to millions or beyond
  - read, write, order and compare numbers up to 10 000 000 and determine the value of each digit
  - round any whole number to a required degree of accuracy
  - use negative numbers in context, and calculate intervals across 0
  - solve number and practical problems that involve all of the above.
- Read and write ratios
  - solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts
  - solve problems involving the calculation of percentages and the use of percentages for comparison
  - solve problems involving similar shapes where the scale factor is known or can be found
  - solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.
- Read and write integers in appropriate contexts
- Read and write exponents and square roots
- **Convert** improper fractions to mixed numbers and vice versa
- **Simplify** fractions in mental and written form
  - use common factors to simplify fractions; use common multiples to express fractions in the same denomination
  - **compare and order** fractions, including fractions >1
  - add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions
  - multiply simple pairs of proper fractions, writing the answer in its simplest form
  - divide proper fractions by whole numbers
- Read, write, compare and order decimal fractions to thousandths or beyond
- Read, write, compare and order percentages
- **Convert** between fractions, decimals and percentages.
  - **identify** the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers are up to three decimal places
  - multiply one-digit numbers with up to 2 decimal places by whole numbers
  - use written division methods in cases where the answer has up to 2 decimal places
  - **solve** problems which require answers to be rounded to specified degrees of accuracy
  - recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

When applying with understanding learners:

- **Classify and Use** whole numbers up to millions or beyond in real-life situations
  - multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
  - divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
  - **Justify** answers by dividing numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
  - perform mental calculations, including with mixed operations and large numbers.
  - **Analyse and identify** common factors, common multiples and prime numbers
  - **Interpret and use** their knowledge of the order of operations to carry out calculations involving the 4 operations
  - solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

	○ **Interpret and use** the vocabulary of prime numbers, prime factors and composite (nonprime) numbers ○ Establish whether a number up to 100 is prime and recall prime numbers up to 19 ○ Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • **Use** ratios in real-life situations and **justify** the same. • **Use and evaluate** integers in real-life situations • **Convert** improper fractions to mixed numbers and vice versa in real-life ○ Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number	○ solve problems involving addition, subtraction, multiplication and division ○ use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. • **Use** ratios in real-life situations and **justify** the same. • **Use and evaluate** integers in real-life situations • **Convert** improper fractions to mixed numbers and vice versa in real-life ○ **Associate** a fraction with division and calculate decimal fraction equivalents for a simple fraction.

Shape and Space

Phase 1

Conceptual understandings	• 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.

Learning outcomes	**Pre-K**
	When constructing meaning learners:
	• Understand that 2D and 3D shapes have characteristics that can be described and compared (I, D, M)
	  ○ Show an interest in shape and space by playing with shapes or making arrangements with objects.
	  ○ Show interest in shape by sustained construction activity or by talking about shapes or arrangements.
	  ○ Use shapes appropriately for tasks.
	  ○ Begin to talk about the shapes of everyday objects, e.g. 'round' and 'tall'.
	  ○ Select a particular named shape. (I, D)
	• 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. (I n D)
	When transferring meaning into symbols learners:
	• Sort, describe and compare 3D shapes
	• Describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down. (I n D)
	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). (I n D)
	  ○ Show awareness of similarities of shapes in the environment and categorizes object according to shape or size. (I, D, M)
		KG1
		When constructing meaning learners:
		• Understand that 2D and 3D shapes have characteristics that can be described and compared
		  ○ Show awareness of symmetry
		• 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. (M)
		When transferring meaning into symbols learners:
		• Sort, describe and compare 3D shapes
		  ○ Explore, identify, sort and compare two dimensional shapes
		  ○ Compose pictures and build designs, shapes and patterns in two dimensional shapes and three-dimensional shapes using various tools or strategies
		• Describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down. (M)
		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). (M)
		  ○ Observe and use positional language (left,right,in between,above and below)-

Conceptual understandings	• 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.	

Learning outcomes	**KG2**
	When constructing meaning learners:
	• 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.
	When transferring meaning into symbols learners:
	• Sort, describe and label 2D and 3D shapes
	  ○ Recognise and name common 2d and 3d shapes, including:2d shapes [rectangles (incl. Squares), circles and triangles] 3d shapes[cuboids (incl. Cubes), pyramids and spheres]
	• Analyse and describe the relationships between 2D and 3D shapes
	• Create and describe symmetrical and tessellating patterns
	• Identify lines of reflective symmetry
	• Represent ideas about the real world using geometric vocabulary and symbols, for example, through oral description, drawing, modelling, labelling
	• Interpret and create simple directions, describing paths, regions, positions and boundaries of their immediate environment.
	  ○ Describe position, directions and movements, including whole, half, quarter and three-quarter turns. (I)
	When applying with understanding learners:
	• Analyse 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.
		G1
		When constructing meaning learners:
		• 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.
		When transferring meaning into symbols learners:
		• Sort, describe and label 2D and 3D shapes
		  ○ Identify and describe the properties of 2d shapes, including the number of sides and line symmetry in a vertical line
		  ○ Identify and describe the properties of 3d shapes, including the number of edges, vertices and faces
		  ○ Compare and sort common 2d and 3d shapes and everyday objects.
		• Analyse and describe the relationships between 2D and 3D shapes
		  ○ Identify 2d shapes on the surface of 3d shapes
		• **Create** and describe symmetrical and tessellating patterns
		• Identify lines of reflective symmetry
		• Represent ideas about the real world using geometric vocabulary and symbols, for example, through oral description, drawing, modelling, labelling
		  ○ Order and arrange combinations of mathematical objects in patterns and sequences
		• **Interpret and create** simple directions, describing paths, regions, positions and boundaries of their immediate environment.
		  ○ Use mathematical vocabulary to describe position, direction and movement including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three quarter turns (clockwise and anticlockwise). -D
		When applying with understanding learners:
		• **Analyse** 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.

Conceptual understandings	• 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.	

Learning outcomes	**G2**
	When constructing meaning learners:
	• 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.
	When transferring meaning into symbols learners:
	• **Sort**, describe and model regular and irregular polygons
	  ○ Draw 2d shapes and make 3d shapes using modelling materials; recognise 3d shapes in different orientations and describe them
	• Describe and model congruency and similarity in 2D shapes
	• Analyse angles by comparing and describing rotations: whole turn; half turn; quarter turn; north, south, east and west on a compass
	  ○ Recognise angles as a property of shape or a description of a turn
	  ○ Identify right angles, recognise that 2 right angles make a halfturn, 3 make three quarters of a turn and 4 a complete turn; identify whether angles are greater than or less than a right angle
	• Locate features on a grid using coordinates
	• Describe and/or represent mental images of objects, patterns, and paths.
	  ○ Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.
	When applying with understanding learners:
	• **Analyse** 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.
		G3
		When constructing meaning learners:
		• 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.
		When transferring meaning into symbols learners:
		• **Sort, describe** and model regular and irregular polygons
		  ○ Use geometric vocabulary when describing shape and space in mathematical situations and beyond
		  ○ **Analyse,** describe, classify and visualize 2d (including circles, triangles and quadrilaterals) and 3d shapes, using geometric vocabulary
		  ○ Use geometric vocabulary when describing shape and space in mathematical situations and beyond
		• Describe and model congruency and similarity in 2D shapes
		  ○ Understand the properties of regular and irregular polyhedra
		• **Analyse** angles by comparing and describing rotations: whole turn; half turn; quarter turn; north, south, east and west on a compass
		• Locate features on a grid using coordinates
		• Describe and/or represent mental images of objects, patterns, and paths.
		  ○ Understand how scale (ratios) is used to enlarge and reduce shapes
		  ○ Describe lines and angles using geometric vocabulary
		When applying with understanding learners:
		• **Analyse** 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.
		  ○ Apply 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
		  ○ **Compare** and systems for describing position and direction

Conceptual understandings	• 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 our world. • Geometric tools and methods can be used to solve problems relating to shape and space.	
Learning outcomes	G4 When constructing meaning learners: • 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. When transferring meaning into symbols learners: • **Analyse, describe, classify** and visualize 2D (including circles, triangles and quadrilaterals) and 3D shapes, using geometric vocabulary ○ Identify 3d shapes, including cubes and other cuboids, from 2d representations • Describe lines and angles using geometric vocabulary ○ Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles ○ Draw given angles, and measure them in degrees (°) ○ Identify: ○ Angles at a point and 1 whole turn (total 360°) ○ Angles at a point on a straight line and half a turn (total 180°) ○ Other multiples of 90° • Identify and use scale (ratios) to enlarge and reduce shapes • Identify and use the language and notation of bearing to describe direction and position ○ Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed. • **Create and model** how a 2D net converts into a 3D shape and vice versa • **Explore** the use of geometric ideas and relationships to solve problems in other areas of mathematics. ○ Use the properties of rectangles to deduce related facts and find missing lengths and angles ○ Distinguish between regular and irregular polygons based on reasoning about equal sides and angles. When applying with understanding learners: • 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.	G5 When constructing meaning learners: • 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. When transferring meaning into symbols learners: • **Analyse**, describe, classify and visualize 2D (including circles, triangles and quadrilaterals) and 3D shapes, using geometric vocabulary ○ draw 2-D shapes using given dimensions and angles • Describe lines and angles using geometric vocabulary ○ **compare** and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons ○ **illustrat**e and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius ○ **recognise** angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. • **Identify** and use scale (ratios) to enlarge and reduce shapes • Identify and use the language and notation of bearing to describe direction and position ○ **describe** positions on the full coordinate grid (all 4 quadrants) ○ **draw and translate** simple shapes on the coordinate plane, and reflect them in the axes. • **Create and model** how a 2D net converts into a 3D shape and vice versa ○ recognise, describe and build simple 3-D shapes, including making nets • **Explore** the use of geometric ideas and relationships to solve problems in other areas of mathematics. When applying with understanding learners: • **Apply** 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 creating models.

Pattern and Function

Phase 1

Conceptual understandings	• Patterns and sequences occur in everyday situations. • Patterns repeat and grow.

Learning outcomes	**Pre-K**
	When constructing meaning learners:
	• Understand that patterns can be found in everyday situations, for example, sounds, actions, objects, nature.
	When transferring meaning into symbols learners:
	• Describe patterns in various ways, for example, using words, drawings, symbols, materials, actions, numbers.
	  ○ Notice simple shapes and patterns in pictures.
	When applying with understanding learners:
	• Extend and create patterns
		KG1
		When constructing meaning learners:
		• Understand that patterns can be found in everyday situations, for example, sounds, actions, objects, nature.
		When transferring meaning into symbols learners:
		• Describe patterns in various ways, for example, using words, drawings, symbols, materials, actions, numbers.
		  ○ Talk about, recognise and recreate simple patterns using various tools and strategies
		  ○ Investigate and develop strategies for doubling quantities to 5
		When applying with understanding learners:
		• Extend and create patterns

Phase 2

Conceptual understandings	• Whole numbers exhibit patterns and relationships that can be observed and described. • Patterns can be represented using numbers and other symbols. •	

Learning outcomes	**KG2**
	When constructing meaning learners:
	• 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.
	When transferring meaning into symbols learners:
	• Represent patterns in a variety of ways, for example, using words, drawings, symbols, materials, actions, numbers
	• Describe number patterns, for example, odd and even numbers, skip counting.
	  ○ Count in multiples of 2s, 5s and 10s
	  ○ Identify odd and even numbers.
	When applying with understanding learners:
	• **Extend and create** patterns in numbers, for example, odd and even numbers, skip counting
	  ○ Create, describe and extend patterns in numbers: skip counting 2, 5 and 10
	  ○ Use a 100 chart to skip count by 2s and 5s to 100
	• Use number patterns to represent and understand real-life situations
	• Use the properties and relationships of addition and subtraction to solve problems.
	  ○ Relate addition to subtraction by writing fact families.
		G1
		When constructing meaning learners:
		• 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.
		When transferring meaning into symbols learners:
		• **Represent** patterns in a variety of ways, for example, using words, drawings, symbols, materials, actions, numbers
		• Describe number patterns, for example, odd and even numbers, skip counting.
		When applying with understanding learners:
		• **Extend and create** patterns in numbers, for example, odd and even numbers, skip counting
		  ○ Count in steps of 2, 3, and 5 from 0, and in 10s from any given number
		• **Predict** and use number patterns to represent and understand real-life situations
		• Use the properties and relationships of addition and subtraction to solve problems.

Phase 3

Conceptual understandings	• Functions are relationships or rules that uniquely associate members of one set with members of another set. • By analysing patterns and identifying rules for patterns it is possible to make predictions.	
Learning outcomes	**G2** When constructing meaning learners: • Understand that patterns can be analysed 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. When transferring meaning into symbols learners: • **Describe** the rule for a pattern in a variety of ways • Represent rules for patterns using words, symbols and tables • **Identify** a sequence of operations relating one set of numbers to another set. ○ Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number When applying with understanding learners: • Select appropriate methods for representing patterns, for example using words, symbols and tables • **Create and use** number patterns to make **predictions** and solve problems • Use the properties and relationships of the four operations to solve problems.	**G3** When constructing meaning learners: • Understand that patterns can be analysed 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. When transferring meaning into symbols learners: • **Describe** the rule for a pattern in a variety of ways • Represent rules for patterns using words, symbols and tables • **Identify** a sequence of operations relating one set of numbers to another set. ○ Count in multiples of 6, 7, 9, 25 and 1,000 When applying with understanding learners: • Select appropriate methods for representing patterns, for example using words, symbols and tables • Use number patterns to make **predictions** and solve problems • **Apply** the properties and relationships of the four operations to solve problems.

Phase 4

Conceptual understandings	• Patterns can often be generalized using algebraic expressions, equations or functions. • Exponential notation is a powerful way to express repeated products of the same number.	
Learning outcomes	**G4** When constructing meaning learners: • 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, analysed and generalized • Using tables, graphs, words, and, when possible, symbolic rules. When transferring meaning into symbols learners: • Represent the rule of a pattern by using a function • **Analyse pattern** and function using words, tables and graphs, and, when possible, symbolic rules. When applying with understanding learners: • Select appropriate methods to **analyse** patterns and **identify** rules ○ Count forwards or backwards in steps of powers of 10 from any given number up to 1,000,000 • **Apply** functions to solve problems.	G5 When constructing meaning learners: • 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, analysed and generalized • Using tables, graphs, words, and, when possible, symbolic rules. When transferring meaning into symbols learners: • Represent the rule of a pattern by using a function ○ **generate** and describe linear number sequences ○ express missing number problems algebraically ○ find pairs of numbers that satisfy an equation with two unknowns ○ **enumerate** possibilities of combinations of 2 variables. • **Analyse** pattern and function using words, tables and graphs, and, when possible, symbolic rules. When applying with understanding learners: • Select appropriate methods to **analyse** patterns and identify rules • Use functions to solve problems. ○ **Create and use** simple formulae ○ Use **functions** to solve problems.

Measurement

Phase 1

<table>
<tr><td>Conceptual understandings</td><td colspan="2">• Measurement involves comparing objects and events.
• Objects have attributes that can be measured using non-standard units.
• Events can be ordered and sequenced.</td></tr>
<tr><td>Learning outcomes</td><td><u>Pre-K</u>
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.
When transferring meaning into symbols learners:
• Identify, compare and describe attributes of real objects, for example, longer, shorter, heavier, empty, full, hotter, colder
○ Begin to use the language of size.
• Compare the length, mass and capacity of objects using non-standard units
○ Order two or three items by length or height.
• Identify, describe and sequence events in their daily routine, for example, before, after, bedtime, storytime, today, tomorrow.
○ Anticipate specific time-based events such as mealtimes or home time
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.</td><td><u>KG1</u>
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.
When transferring meaning into symbols learners:
• Identify, compare and describe attributes of real objects, for example, longer, shorter, heavier, empty, full, hotter, colder
• Compare the length, mass and capacity of objects using nonstandard units
○ Compare and orders two or more objects according to an appropriate measure (length, height, capacity)
• Identify, describe and sequence events in their daily routine, for example, before, after, bedtime, storytime, today, tomorrow.
When applying with understanding learners:
• Describe observations about events and objects in real-life situations
○ Explore different currencies and use them
○ Name the months of the year in order, and reads the date on a calendar
• Use non-standard units of measurement to solve problems in real-life situations involving length, mass and capacity.</td></tr>
</table>

Phase 2

Conceptual understandings	• Standard units allow us to have a common language to identify, compare, order and sequence objects and events. • We use tools to measure the attributes of objects and events. • Estimation allows us to measure with different levels of accuracy.

Learning outcomes

KG2

When constructing meaning learners:

- 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 days 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.

When transferring meaning into symbols learners:

- Estimate and measure objects using standard units of measurement: length, mass, capacity, money and temperature
  - Compare, describe and solve practical problems for:
    - Lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]
    - Mass / weight [heavier than, lighter than, heavy, light]
    - Capacity and volume [full, empty, more than, less than, quarter]
  - Measure and begin to record the following:
    - Lengths and heights, and mass/weight and capacity and volume
  - Recognise and know the value of different denominations of coins and notes
- Read and write the time to the hour, half hour and quarter hour
  - Recognise and use language relating to dates, including days of the week, weeks, months and year
  - Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times
- Estimate and compare lengths of time: second, minute, hour, day, week and month.
  - Compare, describe and solve practical problems for time [quicker, slower, earlier, later]
  - Measure and begin to record the following time (hours, minutes, seconds)
  - Sequence events in chronological order using language i.e. Before, after, next, first, today, yesterday, tomorrow, morning, afternoon and evening.

When applying with understanding learners:

- Use standard units of measurement to solve problems in real-life situations involving length, mass, capacity, money and temperature
- **Estimate and Use** measures of time to assist with problem solving in real-life situations.

G1

When constructing meaning learners:

- 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 days 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.

When transferring meaning into symbols learners:

- **Estimate and measure** objects using standard units of measurement: length, mass, capacity, money and temperature
  - Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°c); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- Read and write the time to the hour, half hour and quarter hour
  - Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.
  - Know the number of minutes in an hour and the number of hours in a day
- **Estimate and compare** lengths of time: second, minute, hour, day, week and month.
  - Compare and order lengths, mass, volume/capacity and record the results using >, < and =

When applying with understanding learners:

- **Apply** standard units of measurement to solve problems in real-life situations involving length, mass, capacity, money and temperature
  - **Recognise** and use symbols for dirhams and fils, and combine amounts to make a particular value.
  - Find different combinations of coins that equal the same amounts of money
- **Estimate and Use** measures of time to assist with problem solving in real-life situations.

Phase 3

Conceptual understandings	• Objects and events have attributes that can be measured using appropriate tools. • Relationships exist between standard units that measure the same attributes.	

Learning outcomes	**G2**
	When constructing meaning learners:
	• 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, 3½ kg, between 4 cm and 5 cm
	• Understand relationships between units, for example, metres, centimetres and millimetres
	• Understand an angle as a measure of rotation.
	When transferring meaning into symbols learners:
	• Estimate and measure using standard units of measurement: perimeter, area and volume.
	  ○ Measure the perimeter of simple 2d shapes
	• Describe measures that fall between numbers on a scale
	• Read and write digital and analogue time on 12-hour and 24-hour clocks.
	  ○ Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, am/pm, morning, afternoon, noon and midnight
	When applying with understanding learners:
	• Use standard units of measurement to solve problems in real-life situations involving perimeter, area and volume
	  ○ **Measure, compare**, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
	  ○ Add and subtract amounts of money to give change, using both dirhams and fils in practical contexts
	  ○ Know the number of seconds in a minute and the number of days in each month, year and leap year
	  ○ **Compare** durations of events
	  ○ Compare and sequence intervals of time
	• Select appropriate tools and units of measurement
	• **Apply** timelines in units of inquiry and other real-life situations.
		G3
		When constructing meaning learners:
		• 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, 3½ kg, between 4 cm and 5 cm
		• Understand relationships between units, for example, metres, centimetres and millimetres
		• Understand an angle as a measure of rotation.
		When transferring meaning into symbols learners:
		• **Estimate and measure** using standard units of measurement: perimeter, area and volume.
		  ○ Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
		  ○ Find the area of rectilinear shapes by counting squares
		• Describe measures that fall between numbers on a scale
		• Read and write digital and analogue time on 12-hour and 24-hour clocks.
		  ○ Read, write and convert time between analogue and digital 12 and 24hour clocks
		  ○ Solve problems involving converting from hours to minutes, minutes to seconds, years to months, weeks to days
		When applying with understanding learners:
		• **Apply** standard units of measurement to solve problems in real-life situations involving perimeter, area and volume
		  ○ **Convert** between different units of measure
		  ○ **Estimate, compare and calculate** different measures, including money in dirhams and fils
		• Select appropriate tools and units of measurement
		• Use timelines in units of inquiry and other real-life situations.

Phase 4

Conceptual understandings	• Accuracy of measurements depends on the situation and the 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.

Learning outcomes

G4

When constructing meaning learners:

- Understand procedures for finding area, perimeter and volume
- Understand the relationships between area and perimeter, between area and volume, and between volume and capacity
- Understand unit conversions within measurement systems (metric or customary).

When transferring meaning into symbols learners:

- Develop and describe formulas for finding perimeter, area and volume
    - Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
    - **Calculate and compare** the area of rectangles (including squares) including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes
    - **Estimate** volume and capacity.
- Use decimal and fraction notation in measurement, for example, 3.2 cm, 1.47 kg, 1½ miles
    - Use all four operations to solve problems involving measure using decimal notation including scaling.
- Read and interpret scales on a range of measuring instruments
- **Measure and construct** angles in degrees using a protractor
- Carry out simple unit conversions within a system of measurement (metric or customary).
    - Solve problems involving converting between units of time

When applying with understanding learners:

- 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 real-life problems involving measurement
- **Apply** decimal and fractional notation in measurement, for example, 3.2 cm, 1.47 kg, 1½ miles
- Use timetables and schedules (12-hour and 24-hour clocks) in real-life situations
- Determine times worldwide.

G5

When constructing meaning learners:

- Understand procedures for finding area, perimeter and volume
- Understand the relationships between area and perimeter, between area and volume, and between volume and capacity
- Understand unit conversions within measurement systems (metric or customary).

When transferring meaning into symbols learners:

- Develop and describe formulas for finding perimeter, area and volume
    - **convert** between miles and kilometres
    - recognise that shapes with the same areas can have different perimeters and vice versa
    - recognise when it is possible to use formulae for area and volume of shapes
    - calculate the area of parallelograms and triangles
    - **calculate, estimate and compare** volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units
- **Apply** decimal and fraction notation in measurement, for example, 3.2 cm, 1.47 kg, 1½ miles
- Read and interpret scales on a range of measuring instruments
- Measure and construct angles in degrees using a protractor
- Carry out simple unit conversions within a system of measurement (metric or customary).

When applying with understanding learners:

- 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 real-life problems involving measurement
    - **Apply** read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3 decimal places
- **Apply** decimal and fractional notation in measurement, for example, 3.2 cm, 1.47 kg, 1½ miles
- Use timetables and schedules (12-hour and 24-hour clocks) in real-life situations
- Determine times worldwide.

Data Handling

Phase 1

Conceptual understandings	• 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.	
Learning outcomes	**Pre-K** 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). When transferring meaning into symbols learners: • Represent information through pictographs and tally marks • Sort and label real objects by attributes. 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.	**KG1** 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). When transferring meaning into symbols learners: • Represent information through pictographs and tally marks ○ Collect objects or data and make representations of their observations, using concrete graph ○ Responds to and poses questions about data collection and graphs • Sort and label real objects by attributes. 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.

Phase 2

Conceptual understandings	• 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

Learning outcomes	**KG2**
	When constructing meaning learners:
	• 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).
	When transferring meaning into symbols learners:
	• Collect and represent data in different types of graphs, for example, tally marks, bar graphs
	  ○ Read or complete tables based on simple, concrete situations.
	• Represent the relationship between objects in sets using tree, Venn and Carroll diagrams
	• **Express** the chance of an event happening using words or phrases (impossible, less likely, maybe, most likely, certain).
	  ○ Discuss events related to students' experiences as likely and unlikely.
	When applying with understanding learners:
	• Collect, display **and interpret** data for the purpose of answering questions
	• **Create** a pictograph and sample 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, most likely, certain).
		G1
		When constructing meaning learners:
		• 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).
		When transferring meaning into symbols learners:
		• Collect and represent data in different types of graphs, for example, tally marks, bar graphs
		  ○ **Interpret** and construct simple pictograms, tally charts, block diagrams and tables
		  ○ Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity
		  ○ Ask and answer questions about totalling and comparing categorical data.
		• Represent the relationship between objects in sets using tree, Venn and Carroll diagrams
		• **Express** the chance of an event happening using words or phrases (impossible, less likely, maybe, most likely, certain).
		When applying with understanding learners:
		• Collect, display and **interpret** data for the purpose of answering questions
		• **Create** a pictograph and sample 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, most likely, certain).

Phase 3

Conceptual understandings	• Data can be collected, organized, displayed and analysed 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 notations.

Learning outcomes	**G2**
	When constructing meaning learners:
	• 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.
	When transferring meaning into symbols learners:
	• Collect, display and interpret data using simple graphs, for example, bar graphs, line graphs
	  ○ **Interpret** and present data using bar charts, pictograms and tables
	  ○ Solve one-step and two-step questions using information presented in scaled bar charts and pictograms and tables.
	• **Identify, read and interpret** range and scale on graphs
	• Identify the mode of a set of data
	• Use tree diagrams to express probability using simple fractions.
	When applying with understanding learners:
	• **Design** a survey and systematically collect, organize and display data in pictographs and bar graphs
	• Select appropriate graph form(s) to display data
	• **Interpret** range and scale on graphs
	• Use probability to determine mathematically fair and unfair games and to explain possible outcomes
	• **Express** probability using simple fractions.
		G3
		When constructing meaning learners:
		• 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.
		When transferring meaning into symbols learners:
		• Collect, display and interpret data using simple graphs, for example, bar graphs, line graphs
		  ○ **Interpret** and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs
		  ○ Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.
		• Identify, read and interpret range and scale on graphs
		• Identify the mode of a set of data
		• Use tree diagrams to **express** probability using simple fractions.
		When applying with understanding learners:
		• **Design** a survey and systematically collect, organize and display data in pictographs and bar graphs
		• Select appropriate graph form(s) to display data
		• **Interpret** range and scale on graphs
		• Use probability to determine mathematically fair and unfair games and to explain possible outcomes
		• **Express** probability using simple fractions.

Phase 4

Conceptual understandings	• Data can be presented effectively for valid interpretation and communication. • Range, mode, median and mean can be used to analyse statistical data. • Probability can be represented on a scale between 0–1 or 0%–100%. • The probability of an event can be predicted theoretically.

Learning outcomes	**G4**
	When constructing meaning learners:
	• 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 (0–1) or per cent (0%–100%)
	• Understand the difference between experimental and theoretical probability.
	When transferring meaning into symbols learners:
	• Collect, display and interpret data in circle graphs (pie charts) and line graphs
	  ○ **Solve** comparison, sum and difference problems using information presented in a line graph.
	  ○ Complete, read and interpret information in tables, including timetables.
	• **Identify, describe and explain** the range, mode, median and mean in a set of data
	• Set up a spreadsheet using simple formulas to manipulate data and to create graphs
	• **Express** probabilities using scale (0–1) or per cent (0%–100%).
	When applying with understanding learners:
	• **Design** a survey and 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 and manipulate** an electronic database for their own purposes
	• **Determine** the theoretical probability of an event and explain why it might differ from experimental probability.
		G5
		When constructing meaning learners:
		• 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 (0–1) or per cent (0%–100%)
		• Understand the difference between experimental and theoretical probability.
		When transferring meaning into symbols learners:
		• **Collect**, display and interpret data in circle graphs (pie charts) and line graphs
		  ○ interpret and construct pie charts and line graphs and use these to solve problems
		• **Identify**, describe and explain the range, mode, median and mean in a set of data
		• Set up a spreadsheet using simple formulas to manipulate data and to create graphs
		• **Express** probabilities using scale (0–1) or per cent (0%–100%).
		When applying with understanding learners:
		• **Design** a survey and 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
		  ○ **calculate** and **interpret** the mean as an average.
		• **Create** and manipulate an electronic database for their own purposes
		Determine the theoretical probability of an event and explain why it might differ from experimental probability.