SIS Math Scopes and Sequences

Mathematics Scope and Sequence has been developed on the basis of the following:

- IB PYP Mathematics Scope and Sequence
- Cambridge Primary Mathematics Curriculum Framework

MATHEMATICS IN THE PYP

What the PYP believes about learning mathematics	The power of mathematics for describing and analysing the world around us is such that it has become a highly effective tool for solving problems. It is also recognized that students can appreciate the intrinsic fascination of mathematics and explore the world through its unique perceptions. In the same way that students describe themselves as "authors" or "artists", a school's programme should also provide students with the opportunity to see themselves as "mathematicians", where they enjoy and are enthusiastic when exploring and learning about mathematics. In the IB Primary Years Programme (PYP), mathematics is also viewed as a vehicle to support inquiry, providing a global language through which we make sense of the world around us. It is intended that students become competent users of the language of mathematics, and can begin to use it as a way of thinking, as opposed to seeing it as a series of facts and equations to be memorized.
Mathematics in a transdisciplinary programme	Wherever possible, mathematics should be taught through the relevant, realistic context of the units of inquiry. The direct teaching of mathematics in a unit of inquiry may not always be feasible but, where appropriate, prior learning or follow-up activities may be useful to help students make connections between the different aspects of the curriculum. Students also need opportunities to identify and reflect on "big ideas" within and between the different strands of mathematics, the programme of inquiry and other subject areas. Links to the transdisciplinary themes should be explicitly made, whether or not the mathematics is being taught within the programme of inquiry. A developing understanding of these links will contribute to the students' understanding of mathematics in the world and to their understanding of the transdisciplinary theme. The role of inquiry in mathematics is important, regardless of whether it is being taught inside or outside the programme of inquiry. However, it should also be recognized that there are occasions when it is preferable for students to be given a series of strategies for learning mathematical skills in order to progress in their mathematical understanding rather than struggling to proceed.
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

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How children learn mathematics can be described using the following stages:

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 understanding 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.

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STRANDS OF MATHEMATICS IN THE PYP

Data handling	• Data handling allows us to make a summary of what we know about the world and to make inferences about what we do not know. • Data can be collected, organized, represented and summarized in a variety of ways to highlight similarities, differences and trends; the chosen format should illustrate the information without bias or distortion. • Probability can be expressed qualitatively by using terms such as “unlikely”, “certain” or “impossible”. It can be expressed quantitatively on a numerical scale.
Measurement	• To measure is to attach a number to a quantity using a chosen unit. Since the attributes being measured are continuous, ways must be found to deal with quantities that fall between numbers. It is important to know how accurate a measurement needs to be or can ever be.
Shape and space	• The regions, paths and boundaries of natural space can be described by shape. An understanding of the interrelationships of shape allows us to interpret, understand and appreciate our two-dimensional (2D) and three-dimensional (3D) world.
Pattern and function	• To identify patterns is to begin to understand how mathematics applies to the world in which we live. The repetitive features of patterns can be identified and described as generalized rules called “functions”. This builds a foundation for the later study of algebra. • Our number system is a language for describing quantities and the relationships between quantities. For example, the value attributed to a digit depends on its place within a base system.
Number	• Numbers are used to interpret information, make decisions and solve problems. For example, the operations of addition, subtraction, multiplication and division are related to one another and are used to process information in order to solve problems. The degree of precision needed in calculating depends on how the result will be used.

SIS Math Scopes and Sequences

NURSERY

Data handling
PHASE 1: Learners will develop an understanding of how the collection and organization of information helps to make sense of the world. They will sort, describe and label objects by attributes and represent information in graphs including pictographs and tally marks. The learners will discuss chance in daily events. **Conceptual understandings:** ● Organizing objects and events helps us to solve problems ● We collect information to make sense of the world around us
Learners will develop an understanding that: 1. Sets can be organized by different attributes such as color, type, size, and shape. 2. Children will be able to match pairs of identical or related objects, enhancing their recognition skills. 3. Children will sort real objects into sets based on specified criteria and label these sets appropriately.
Measurement
PHASE 1: Learners will develop an understanding of how measurement involves the comparison of objects and the ordering and sequencing of events. They will be able to identify, compare and describe attributes of real objects as well as describe and sequence familiar events in their daily routine. **Conceptual understandings:** ● Events can be ordered and sequenced ● Measurement involves comparing objects and events **Learners will develop an understanding that:** ● events in daily routines can be described and sequenced, for example, before, after, bedtime, storytime, today, tomorrow ● attributes of real objects can be compared and described, for example, longer, shorter, heavier, empty, full, hotter, colder

1. Children will be able to identify and describe the sequence of daily routines, using terms like before, after, and during specific times (e.g., snack time, storytime).
2. Children will compare and describe the attributes of real objects using vocabulary related to length (long/short), mass (heavy/light), and capacity (full/empty).
3. Children will organize sets of real objects by size and length, demonstrating their understanding of comparative attributes.
4. Children will list the days of the week, months of the year in order.

Shape and space

PHASE 1:

Learners will understand that shapes have characteristics that can be described and compared. They will understand and use common language to describe paths, regions and boundaries of their immediate environment.

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.

Learners will develop an understanding that:

- 2D and 3D shapes have characteristics that can be described and compared
- common language can be used to describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down.

1. Children will be able to sort, describe, and name familiar 2D shapes (e.g., circle, square, triangle) and recognize basic characteristics of 3D shapes.
2. Children will use everyday language to describe the position and direction of objects (e.g., left, right, above, below, inside, outside).
3. Children will compare and contrast the properties of 2D and 3D shapes, enhancing their descriptive language and critical thinking skills.

SIS Math Scopes and Sequences

Pattern and function
PHASE 1: Learners will understand that patterns and sequences occur in everyday situations. They will be able to identify, describe, extend and create patterns in various ways. **Conceptual understandings:** ● Patterns and sequences occur in everyday situations. **Learners will develop an understanding that:** ● Patterns can be found in everyday situations, for example, sounds, actions, objects, nature.
1. Children will listen for and identify simple patterns in sounds, such as clapping sequences or musical rhythms, enhancing their auditory discrimination skills. 2. Children will recognize and describe patterns in actions, such as jumping, clapping, or dancing, promoting physical coordination and memory. 3. Children will use familiar everyday objects (e.g., blocks, toys) to create and extend simple patterns, developing their fine motor skills and cognitive abilities.
Number
PHASE 1: Learners will understand that numbers are used for many different purposes in the real world. They will develop an understanding of one-to-one correspondence and conservation of number, and be able to count and use number words and numerals to represent quantities. **Conceptual understandings:** ● Numbers are naming systems ● 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 numbers can help us to develop number sense **Learners will develop an understanding that:** ● one-to-one correspondence ● for a set of objects, the number name of the last object counted describes the quantity of the whole set ● numbers can be constructed in multiple ways, for example, by combining and partitioning ● conservation of number ● the relative magnitude of whole numbers

SIS Math Scopes and Sequences

1. Demonstrate one-to-one correspondence by counting objects and understanding that each object corresponds to one number name.
2. Children will understand that the number name of the last object counted describes the total quantity of a set, reinforcing their grasp of counting principles.
3. Children will count to 10 forwards and backwards, starting from any number, enhancing their number sequencing skills.
4. Children will practice subitizing by quickly recognizing small collections of objects (up to 5) without needing to count them, improving their visual and cognitive processing.
5. Children will compare two numbers using terms like "more" and "less,"
6. Children will order a selected set of numbers up to 10, promoting their organizational and sequencing abilities.
7. Children will connect number names and numerals (0-10) to the quantities they represent.
8. Children will use ordinal numbers (first, second, third, etc.) in real-life situations to describe the position of objects or people.
9. Children will represent practical situations involving addition.

SIS Math Scopes and Sequences

RECEPTION

Data handling

PHASE 1:
Learners will develop an understanding of how the collection and organization of information helps to make sense of the world. They will sort, describe and label objects by attributes and represent information in graphs including pictographs and tally marks. The learners will discuss chance in daily events.

Conceptual understandings:

- Organizing objects and events helps us to solve problems
- We collect information to make sense of the world around us

Learners will develop an understanding that:

- sets can be organized by different attributes
- information about themselves and their surrounding can be obtained in different ways

1. Match pairs of identical or related objects
2. Select criteria for sorting
3. Sort and label real objects into sets by attributes (colour, type, size, shape)
4. Answer yes/no questions about themselves and familiar objects to collect information
5. Representing information using simple displays (creating living graphs using real objects and people)

Measurement

PHASE 1:
Learners will develop an understanding of how measurement involves the comparison of objects and the ordering and sequencing of events. They will be able to identify, compare and describe attributes of real objects as well as describe and sequence familiar events in their daily routine.

Conceptual understandings:

- Events can be ordered and sequenced
- Measurement involves comparing objects and events

Learners will develop an understanding that:

- events in daily routines can be described and sequenced, for example, before, after, bedtime, storytime, today, tomorrow
- attributes of real objects can be compared and described, for example, longer, shorter, heavier, empty, full, hotter, colder

1. Introduce the language of length (long/short), mass (heavy/light) and capacity (full/empty, more/less)
2. Identify, compare and describe attributes of real objects, for example, longer/shorter, heavier/lighter, full/empty
3. Put sets of real objects in order of size and length
4. Identify, describe and sequence events in their daily school routine, for example, after, before, snack, lunch
5. Begin to read o'clock time (snack - 9 o'clock, lunch - 12 o'clock, etc.)
6. List days of the week, months of the year and seasons in order
7. Connect days of the week to familiar events and actions

Shape and space

PHASE 1:

Learners will understand that shapes have characteristics that can be described and compared. They will understand and use common language to describe paths, regions and boundaries of their immediate environment.

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.

Learners will develop an understanding that:

- 2D and 3D shapes have characteristics that can be described and compared
- common language can be used to describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down.

1. Sort, describe and name familiar 2D shapes (circle, square, rectangle, triangle, diamond, heart, oval)
2. Create patterns using familiar 2D shapes
3. Use everyday language to describe position and direction (left, right, behind, next to)
4. Explore and describe the paths, regions and boundaries of their immediate environment

Pattern and function

PHASE 1:
Learners will understand that patterns and sequences occur in everyday situations. They will be able to identify, describe, extend and create patterns in various ways.

Conceptual understandings:

- Patterns and sequences occur in everyday situations.

SIS Math Scopes and Sequences

Learners will develop an understanding that:

- Patterns can be found in everyday situations, for example, sounds, actions, objects, nature.

1. Recognize and describe simple patterns (sounds, actions, objects, nature)
2. Create simple patterns using real objects and drawings

Number

PHASE 1:

Learners will understand that numbers are used for many different purposes in the real world. They will develop an understanding of one-to-one correspondence and conservation of number, and be able to count and use number words and numerals to represent quantities.

Conceptual understandings:

- Numbers are naming systems
- 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 numbers can help us to develop number sense

Learners will develop an understanding that:

- one-to-one correspondence
- for a set of objects, the number name of the last object counted describes the quantity of the whole set
- numbers can be constructed in multiple ways, for example, by combining and partitioning
- conservation of number
- the relative magnitude of whole numbers

1. Read, write and model numbers to 10
2. Count to 10 forwards and backwards by naming numbers in sequences from any starting point
3. Count to determine the number of objects in a set (up to 10 objects; one-to-one correspondence)
4. Explore the conservation of number through the use of manipulatives (regardless of the arrangement, the amount stays the same)
5. Subitise small collections of objects (up to 5 objects without counting)
6. Compare two numbers using more and less
7. Order a set of selected numbers
8. Connect number names and numerals up to 10 to the quantities they represent, including zero
9. Use ordinal numbers to 10 in real-life situations
10. Introduce vocabulary involved in adding (one more, add, and)
11. Introduce vocabulary involved in subtracting (one less/take away)
12. Represent practical situations to model addition and subtraction within 10 on concrete materials or pictures.

YEAR 1 LEARNING OUTCOMES

Data handling
Phase 2 Learners will understand how information can be expressed as organized and structured data and that this can occur in a range of ways. They will collect and represent data in different types of graphs, interpreting the resulting information for the purpose of answering questions. The learners will develop an understanding that some events in daily life are more likely to happen than others and they will identify and describe likelihood using appropriate vocabulary. **Conceptual understandings:** ● Events in daily life involve chance ● Organizing objects and events helps us to solve problems ● We collect information to make sense of the world around us **Learners will develop an understanding that:** ● sets can be organized by different attributes ● information about themselves and their surrounding can be obtained in different ways
1. Answer non-statistical questions (categorical data). 2. Record, organise and represent categorical data using: - practical resources and drawings - lists and tables - Venn and Carroll diagrams - block graphs and pictograms. 3. Describe data, using familiar language including reference to more, less, most or least to answer non-statistical questions and discuss conclusions.

SIS Math Scopes and Sequences

Measurement

Phase 2

Learners will understand that standard units allow us to have a common language to measure and describe objects and events, and that while estimation is a strategy that can be applied for approximate measurements, particular tools allow us to measure and describe attributes of objects and events with more accuracy. Learners will develop these understandings in relation to measurement involving length, mass, capacity, money, temperature and time.

Conceptual understandings:

- Events can be ordered and sequenced
- Measurement involves comparing objects and events
- Objects have attributes that can be measured using non-standard units

Learners will develop an understanding that:

- events in daily routines can be described and sequenced, for example, before, after, bedtime, storytime, today, tomorrow
- attributes of real objects can be compared and described, for example, longer, shorter, heavier, empty,

1. Use familiar language to describe length, including long, longer, longest, thin, thinner, thinnest, short, shorter, shortest, tall, taller and tallest.
2. Use familiar language to describe mass, including heavy, light, less and more.
3. Use familiar language to describe capacity, including full, empty, less and more.
4. Explore instruments that have numbered scales, and select the most appropriate instrument to measure length, mass, capacity and temperature.
5. Recognise money used in local currency.

Shape and space

Phase 2

Learners will continue to work with 2D and 3D shapes, developing the understanding that shapes are classified and named according to their properties. They will understand that examples of symmetry and transformations can be found in their immediate environment. Learners will interpret, create and use simple directions and specific vocabulary to describe paths, regions, positions and boundaries of their immediate environment.

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

SIS Math Scopes and Sequences

Learners will develop an understanding that:

- 2D and 3D shapes have characteristics that can be described and compared
- common language can be used to describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down

1. Identify, describe and sort 2D shapes by their characteristics or properties, including reference to the number of sides and whether the sides are curved or straight.
2. Identify, describe and sort 3D shapes by their properties, including reference to the number of faces, edges and whether faces are flat or curved.
3. Differentiate between 2D and 3D shapes.
4. Identify when a shape looks identical as it rotates.
5. Use familiar language to describe position and direction.

Pattern and function

Phase 2

Learners will understand that whole numbers exhibit patterns and relationships that can be observed and described, and that the patterns can be represented using numbers and other symbols. As a result, learners will understand the inverse relationship between addition and subtraction, and the associative and commutative properties of addition. They will be able to use their understanding of pattern to represent and make sense of real-life situations and, where appropriate, to solve problems involving addition and subtraction.

Conceptual understandings:

- Patterns and sequences occur in everyday situations
- Patterns repeat and grow
- Patterns can be represented using numbers and other symbols

Learners will develop an understanding that:

- patterns can be found in everyday situations, for example, sounds, actions, objects, nature
- patterns can be found in numbers, for example, odd and even numbers, skip counting

1. Count on in ones, twos or tens, and count back in ones and tens, starting from any number (from 0 to 20).
2. Understand even and odd numbers as ‘every other number’ when counting

Number

Phase 2

SIS Math Scopes and Sequences

Learners will develop their understanding of the base 10 place value system and will model, read, write, estimate, compare and order numbers to hundreds or beyond. They will have automatic recall of addition and subtraction facts and be able to model addition and subtraction of whole numbers using the appropriate mathematical language to describe their mental and written strategies. Learners will have an understanding of fractions as representations of whole-part relationships and will be able to model fractions and use fraction names in real-life situations.

Conceptual understandings:

- Numbers are naming systems
- 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 numbers can help us to develop number sense

Learners will develop an understanding that:

- one-to-one correspondence
- for a set of objects, the number name of the last object counted describes the quantity of the whole set
- numbers can co constructed in multiple ways, for example, by combining and partitioning
- conservation of number
- the relative magnitude of whole numbers
- whole-part relationships

1. Count objects from 0 to 20, recognising conservation of number and one-to-one correspondence.
2. Recognise the number of objects presented in familiar patterns up to 10, without counting.
3. Estimate the number of objects or people (up to 20), and check by counting.
4. Use familiar language to describe sequences of objects.
5. Recite, read and write number names and whole numbers (from 0 to 20).
6. Understand that zero represents none of something.
7. Compose, decompose and regroup numbers from 10 to 20.
8. Understand the relative size of quantities to compare and order numbers from 0 to 20.
9. Recognise and use the ordinal numbers from 1st to 10th.
10. Understand addition as:counting on, combining two sets.
11. Understand subtraction as: counting back, take away, difference.
12. Recognise complements of 10.
13. Estimate, add and subtract whole numbers (where the answer is from 0 to 20).
14. Know doubles up to double 10.
15. Understand that an object or shape can be split into two equal parts or two unequal parts.
16. Understand that a half can describe one of two equal parts of a quantity or set of objects.
17. Understand that a half can act as an operator (whole number answers).
18. Understand and visualise that halves can be combined to make wholes.

SIS Math Scopes and Sequences

YEAR 2 LEARNING OUTCOMES

Data handling
Phase 2 Learners will understand how information can be expressed as organized and structured data and that this can occur in a range of ways. They will collect and represent data in different types of graphs, interpreting the resulting information for the purpose of answering questions. The learners will develop an understanding that some events in daily life are more likely to happen than others and they will identify and describe likelihood using appropriate vocabulary. **Conceptual understandings:** ● Events in daily life involve chance ● Objects and events can be organized in different ways ● Information can be expressed as organised and structured data **Learners will develop an understanding that:** ● sets can be organized by one or more attributes ● information about themselves and their surrounding can be collected and recorded in different ways
1. Identify chance in daily events (certain/possible, impossible events) 2. Describe outcomes of events as likely and unlikely 3. Sort, describe and label real objects into sets by one or more attributes 4. Discuss data represented in tree, Venn and Carroll diagrams 5. Identify a question of interest based on one categorical variable and gather data relevant to the question 6. Collect, classify and represent data using lists, tables, pictographs, tally marks as well as simple bar graphs from a graph of real objects 7. Interpret data for the purpose of answering questions related to comparing quantities (more, fewer, less than, greater than) **2Ss.01** Conduct an investigation to answer non-statistical and statistical questions (categorical data). **2Ss.02** Record, organise and represent categorical data. Choose and explain which representation to use in a given situation: 1. lists and tables 2. Venn and Carroll diagrams 3.tally charts 4. block graphs and pictograms. **2Ss.03** Describe data, identifying similarities and variations to answer non-statistical and statistical questions and discuss conclusions. **2Sp.01** Use familiar language associated with patterns and randomness, including regular pattern and random pattern. **2Sp.02** Conduct chance experiments with two outcomes, and present and describe the results.

SIS Math Scopes and Sequences

Measurement
Phase 2 Learners will understand that standard units allow us to have a common language to measure and describe objects and events, and that while estimation is a strategy that can be applied for approximate measurements, particular tools allow us to measure and describe attributes of objects and events with more accuracy. Learners will develop these understandings in relation to measurement involving length, mass, capacity, money, temperature and time. **Conceptual understandings:** ● Objects have attributes that can be measured using non-standard units ● 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 **Learners will develop an understanding that:** ● tools can be used to measure ● calendars can be used to determine the date, and to identify and sequence days of the week and months of the year ● time is measured using universal units of measure, for example, years, months, days, hours, minutes and seconds
1. Compare and order several shapes and objects based on length, area and capacity using appropriate non- standard units 2. Compare masses of objects using balance scales 3. Use non-standard units of measurement to solve problems in real-life situations involving length, area, mass and capacity 4. Estimate and compare lengths of time: minute, hour, day, week, month and year 5. Read and write analogue and digital time to the full hour and half hour, using the language of 'past' 6. Use a calendar to determine the date, and to identify and sequence days of the week and months of the year including determining the number of days in each month **2Gg.03** Understand that length is a fixed distance between two points. Estimate and measure lengths using non-standard or standard units. **2Gg.04** Draw and measure lines, using standard units. **2Gg.06** Understand that mass is the quantity of matter in an object. Estimate and measure familiar objects using non-standard or standard units. **2Gg.07** Understand that capacity is the maximum amount that an object can contain. Estimate and measure the capacity of familiar objects using non-standard or standard units. **2Gg.12** Understand a measuring scale as a continuous number line where intermediate points have value.

2Gt.01 Order and compare units of time (seconds, minutes, hours, days, weeks, months and years).

2Gt.02 Read and record time to five minutes in digital notation (12-hour) and on analogue clocks.

2Gt.03 Interpret and use the information in calendars.

Shape and space

Phase 2
Learners will continue to work with 2D and 3D shapes, developing the understanding that shapes are classified and named according to their properties. They will understand that examples of symmetry and transformations can be found in their immediate environment. Learners will interpret, create and use simple directions and specific vocabulary to describe paths, regions, positions and boundaries of their immediate environment.

Conceptual understandings:

- Shapes are classified and named according to their properties
- Specific vocabulary can be used to describe an object's position in space

Learners will develop an understanding that:

- there are relationships among and between 2D and 3D shapes
- examples of symmetry and transformations can be found in their immediate environment
- directions can be used to describe pathways, regions, positions and boundaries of their immediate environment

1. Identify, name and draw 2D shapes (square, circle, triangle, rectangle, hexagon, pentagon, oval)
2. Describe the features of 2D shapes (sides, corners)
3. Identify, name and sort 3D shapes (cone, cube, cylinder, sphere)
4. Describe the features of 3D objects (faces, corners, edges)
5. Make models of three-dimensional objects
6. Analyse and describe the relationship between 2D and 3D shapes
7. Find and explain symmetry in the environment
8. Create and describe symmetrical designs
9. Describe the position of an object in relation to another object (beside, in front of, up. down, next to, behind, between, below, above)
10. Give and follow simple directions describing paths, regions, positions and boundaries of their immediate environment

2Gg.01 Identify, describe, sort, name and sketch 2D shapes by their properties, including reference to regular polygons, number of sides and vertices. Recognise these shapes in different positions and orientations.

2Gg.02 Understand that a circle has a centre and any point on the boundary is at the same distance from the centre.

2Gg.05 Identify, describe, sort and name 3D shapes by their properties, including reference to number and shapes of faces,

edges and vertices.

2Gg.08 Identify 2D and 3D shapes in familiar objects.

2Gg.09 Identify a horizontal or vertical line of symmetry on 2D shapes and patterns.

2Gg.10 Predict and check how many times a shape looks identical as it completes a full turn.

2Gg.11 Understand that an angle is a description of a turn, including reference to the terms whole, half and quarter turns, both clockwise and anticlockwise.

2Gp.01 Use knowledge of position and direction to describe movement.

2Gp.02 Sketch the reflection of a 2D shape in a vertical mirror line, including where the mirror line is the edge of the shape.

Pattern and function

Phase 2
Learners will understand that whole numbers exhibit patterns and relationships that can be observed and described, and that the patterns can be represented using numbers and other symbols. As a result, learners will understand the inverse relationship between addition and subtraction, and the associative and commutative properties of addition. They will be able to use their understanding of pattern to represent and make sense of real-life situations and, where appropriate, to solve problems involving addition and subtraction.

Conceptual understandings:

- Patterns and sequences occur in everyday situations
- Patterns repeat and grow
- Patterns can be represented using numbers and other symbols

Learners will develop an understanding that:

- patterns can be found in everyday situations, for example, sounds, actions, objects, nature
- patterns can be found in numbers, for example, odd and even numbers, skip counting

1. Describe, extend and create various patterns
2. Describe, extend and create number patterns, for example, odd and even numbers, skip counting
3. Identify missing elements in simple number patterns
4. Identify the commutative property of addition (4+3=3+4)
5. Solve word problems by using number sentences for addition or subtraction

2Nc.04 Count on and count back in ones, twos, fives or tens, starting from any number (from 0 to 100).

2Nc.05 Recognise the characteristics of even and odd numbers (from 0 to 100).

2Nc.06 Recognise, describe and extend numerical sequences (from 0 to 100).

2Np.01 Understand and explain that the value of each digit in a 2-digit number is determined by its position in that

number, recognising zero as a place holder.

2Np.02 Compose, decompose and regroup 2-digit numbers, using tens and ones.

Number

Phase 2
Learners will develop their understanding of the base 10 place value system and will model, read, write, estimate, compare and order numbers to hundreds or beyond. They will have automatic recall of addition and subtraction facts and be able to model addition and subtraction of whole numbers using the appropriate mathematical language to describe their mental and written strategies. Learners will have an understanding of fractions as representations of whole-part relationships and will be able to model fractions and use 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 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
- Number operations can be modelled in a variety of ways
- There are many mental methods that can be applied for exact and approximate computations

1. Read, write and model numbers to 100
2. Read and write number names to 100 (78 - seventy-eight)
3. Count to 100 forwards and backwards in 1s, 2s, 3s, 5s and 10s from any starting point
4. Compare and order numbers to at least 100
5. Apply place value to partition collections up to 100 in tens and ones/units
6. Identify odd and even numbers
7. Read, write, compare and order ordinal numbers to 31 (including the use of them in dates)
8. Estimate quantities to 20 and count to check
9. Use mathematical vocabulary and symbols of addition and subtraction (+, -, =, add, sum, total, subtract, take away, difference)
10. Automatically recall addition and subtraction number facts to 10
11. Represent and solve addition and subtraction problems at least within 20 using a range of efficient mental and written strategies (count on, count back, doubles, number line)
12. Represent multiplication as repeated addition, groups and arrays
13. Represent division as grouping into equal sets
14. Recognise and interpret common uses of halves and quarters of shapes and collections
15. Recognise, describe and order Ghana Cedi coins and notes according to their value
16. Count small collections of coins and notes.

SIS Math Scopes and Sequences

2Nc.01 Count objects from 0 to 100.

2Nc.02 Recognise the number of objects presented in unfamiliar patterns up to 10, without counting.

2Nc.03 Estimate the number of objects or people (up to 100).

2Nm.01 Recognise value and money notation used in local currency.

2Nm.02 Compare values of different combinations of coins or notes.

2Ni.01 Recite, read and write number names and whole numbers (from 0 to 100).

2Ni.02 Understand and explain the relationship between addition and subtraction.

2Ni.03 Recognise complements of 20 and complements of multiples of 10 (up to 100).

2Ni.04 Estimate, add and subtract whole numbers with up to two digits (no regrouping of ones or tens).

2Np.03 Understand the relative size of quantities to compare and order 2-digit numbers.

2Np.04 Recognise and use ordinal numbers.

2Np.05 Round 2-digit numbers to the nearest 10.

2Ni.05 Understand multiplication as:
- repeated addition
- an array.

2Ni.06 Understand division as:
- sharing (number of items per group)
- grouping (number of groups)
- repeated subtraction.

2Ni.07 Know 1, 2, 5 and 10 times tables.

SIS Math Scopes and Sequences

YEAR 3 LEARNING OUTCOMES

Data handling
Phase 3 Learners will continue to collect, organize, display and analyse data, developing an understanding of how different graphs highlight different aspects of data more efficiently. They will understand that scale can represent different quantities in graphs and that mode can be used to summarize a set of data. The learners will make the connection that probability is based on experimental events and can be expressed numerically. **Conceptual understandings:** ● Some events in daily life are more likely to happen than the others ● Objects and events can be organized in different ways ● Information can be expressed as organised and structured data **Learners will develop an understanding that:** ● the concept of chance in daily events ● sets can be organized by one or more attributes ● information about themselves and their surroundings can be collected and recorded in different ways.
1. **3Ss.01** Conduct an investigation to answer non-statistical and statistical questions (categorical and discrete data). 2. **3Ss.02** Record, organise and represent categorical and discrete data. Choose and explain which representation to use in a given situation: 3. Venn and Carroll diagrams 4. tally charts and frequency tables 5. pictograms and bar charts. 6. **3Ss.03** Interpret data, identifying similarities and variations, within data sets, to answer non-statistical and statistical questions and discuss conclusions. 7. **3Sp.01** Use familiar language associated with chance to describe events, including 'it will happen', 'it will not happen', 'it might happen'. 8. **3Sp.02** Conduct chance experiments, and present and describe the results.

SIS Math Scopes and Sequences

Measurement

Phase 3:
Learners will continue to use standard units to measure objects, in particular developing their understanding of measuring perimeter, area and volume. They will select and use appropriate tools and units of measurement, and will be able to describe measures that fall between two numbers on a scale. The learners will be given the opportunity to construct meaning about the concept of an angle as a measure of rotation.

Conceptual understandings:

- Objects have attributes that can be measured using non-standard units
- 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

Learners will develop an understanding that:

- Choose the appropriate unit of time for familiar activities.
- Read and record time accurately in digital notation (12-hour) and on analogue clocks.
- Interpret and use the information in timetables (12-hour clock).
- Understand the difference between a time and a time interval. Find time intervals between the same units in days, weeks, months and years.
- Estimate and measure lengths in centimetres (cm), metres (m) and kilometres (km). Understand the relationship between units.
- Understand that perimeter is the total distance around a 2D shape and can be calculated by adding lengths, and area is how much space a 2D shape occupies within its boundary.
- Draw lines, rectangles and squares. Estimate, measure and calculate the perimeter of a shape, using appropriate metric units, and area on a square grid.
- Estimate and measure the mass of objects in grams (g) and kilograms (kg). Understand the relationship between units.
- Estimate and measure capacity in millilitres (m*l*) and litres (*l*), and understand their relationships.
- Use instruments that measure length, mass, capacity and temperature.

1. Estimate, measure, compare and record lengths and distances using non-standard and standard units (m, cm)
2. Estimate, measure, compare and record masses and capacities of two or more objects using non-standard units
3. Estimate, measure, compare and record areas using non-standard units
4. Estimate, compare and record temperatures using non-standard and standard (ºC) units
5. Use standard and non-standard units of measurement to solve problems in real-life situations involving length, area, mass, capacity and temperature
6. Estimate and compare lengths of time: second, minute, hour, day, week, month and year, and investigate the relationship between them
7. Read and write digital and analogue time to the full hour, half hour and quarter hour using the language of ‘past’ and ‘to’

8. Use a calendar to determine date, and to identify the year, month, week and day
9. Use familiar measures of time to assist with problem solving in real-life situations
10. Use timelines in real-life situations

Shape and space

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

Learners will develop an understanding that:

- there are relationships among and between 2D and 3D shapes
- 2D and 3D shapes can be created by putting together and/or taking apart other shapes
- examples of symmetry and transformations can be found in their immediate environment
- directions can be used to describe pathways, regions, positions and boundaries of their immediate environment

1. Identify, describe, classify, name and sketch 2D shapes by their properties. Differentiate between regular and irregular polygons.
2. Identify, describe, sort, name and sketch 3D shapes by their properties.
3. Recognise pictures, drawings and diagrams of 3D shapes.
4. Identify both horizontal and vertical lines of symmetry on 2D shapes and patterns.
5. Compare angles with a right angle. Recognise that a straight line is equivalent to two right angles or a half turn.
6. Interpret and create descriptions of position, direction and movement, including reference to cardinal points.
7. Sketch the reflection of a 2D shape in a horizontal or vertical mirror line, including where the mirror line is the edge of the shape.

SIS Math Scopes and Sequences

Pattern and function

Phase 3
Learners will analyse patterns and identify rules for patterns, developing the understanding that functions describe the relationship or rules that uniquely associate members of one set with members of another set. They will understand the inverse relationship between multiplication and division, and the associative and commutative properties of multiplication. They will be able to use their understanding of pattern and function to represent and make sense of real-life situations and, where appropriate, to solve problems involving the four operations.

Conceptual understandings:

- Whole numbers exhibit patterns and relationships that can be observed and described
- Patterns can be represented using numbers and other symbols

Learners will develop an understanding that:

- patterns can be found in numbers, for example, odd and even numbers, skip counting
- the inverse relationship between addition and subtraction
- the associative and commutative properties of addition
- the inverse relationship between multiplication and division

1. Count on and count back in steps of constant size: 1-digit numbers, tens or hundreds, starting from any number (from 0 to 1000).
2. Recognise and extend linear sequence, and describe the term-to-term rule.
3. Extend spatial patterns formed from adding and subtracting a constant.
4. Understand and explain that the value of each digit is determined by its position in that number (up to 3-digit numbers).
5. Use knowledge of place value to multiply whole numbers by 10.
6. Compose, decompose and regroup 3-digit numbers, using hundreds, tens and ones.
7. Round 3-digit numbers to the nearest 10 or 100.

Number

Phase 3
Learners will develop the understanding that fractions and decimals are ways of representing whole-part relationships and will demonstrate this understanding by modelling equivalent fractions and decimal fractions to hundredths or beyond. They will be able to model, read, write, compare and order fractions, and use them in real-life situations. Learners will have automatic recall of addition, subtraction, multiplication and division facts. They will select, use and describe a range of strategies to solve problems involving addition, subtraction, multiplication and division, using estimation strategies to check the reasonableness of their answers.

SIS Math Scopes and Sequences

Conceptual understandings:

- The base 10 place value system is used to represent numbers and number relationships
- Fractions 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
- Number operations can be modelled in a variety of ways
- There are many mental methods that can be applied for exact and approximate computations

1. **3Nc.01** Estimate the number of objects or people (up to 1000).
2. **3Nc.03** Use knowledge of even and odd numbers up to 10 to recognise and sort numbers.
3. **3Nc.04** Recognise the use of an object to represent an unknown quantity in addition and subtraction calculations.
4. **3Nm.01** Interpret money notation for currencies that use a decimal point.
5. **3Nm.02** Add and subtract amounts of money to give change.
6. **3Ni.01** Recite, read and write number names and whole numbers (from 0 to 1000).
7. **3Ni.02** Understand the commutative and associative properties of addition, and use these to simplify calculations.
8. **3Ni.03** Recognise complements of 100 and complements of multiples of 10 or 100 (up to 1000).
9. **3Ni.04** Estimate, add and subtract whole numbers with up to three digits (regrouping of ones or tens).
10. **3Np.04** Understand the relative size of quantities to compare and order 3-digit positive numbers, using the symbols =, > and <.
11. **3Ni.05** Understand and explain the relationship between multiplication and division.
12. **3Ni.06** Understand and explain the commutative and distributive properties of multiplication, and use these to simplify calculations.
13. **3Ni.07** Know 1, 2, 3, 4, 5, 6, 8, 9 and 10 times tables.
14. **3Ni.08** Estimate and multiply whole numbers up to 100 by 2, 3, 4 and 5.
15. **3Ni.09** Estimate and divide whole numbers up to 100 by 2, 3, 4 and 5.
16. **3Ni.10** Recognise multiples of 2, 5 and 10 (up to 1000).
17. **3Nf.01** Understand and explain that fractions are several equal parts of an object or shape and all the parts, taken together, equal one whole.
18. **3Nf.02** Understand that the relationship between the whole and the parts depends on the relative size of each, regardless of their shape or orientation.
19. **3Nf.03** Understand and explain that fractions can describe equal parts of a quantity or set of objects.
20. **3Nf.04** Understand that a fraction can be represented as a division of the numerator by the denominator (half, quarter and three-quarters).
21. **3Nf.05** Understand that fractions (half, quarter, three-quarters, third and tenth) can act as operators.
22. **3Nf.06** Recognise that two fractions can have an equivalent value (halves, quarters, fifths and tenths).
23. **3Nf.07** Estimate, add and subtract fractions with the same denominator (within one whole).
24. **3Nf.08** Use knowledge of equivalence to compare and order unit fractions and fractions with the same denominator, using the symbols =, > and <.

Mental strategies:

- Find 1, 10, 100 more/less than two- and three-digit numbers
- Find 20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300 more/less than three-digit numbers
- Derive quickly pairs of multiples of 100 with a total of 1000, e.g. 400+600=1000
- Derive quickly pairs of multiples of 5 with a total of 100, e.g. 45+55=100

• Derive quickly doubles of all whole numbers to 20 and derive related halves • Derive quickly doubles of multiples of 5 to 100 and multiples of 50 to 500 • Add and subtract 10 and multiples of 10 to and from two- and three-digit numbers • Add 100 and multiples of 100 to three-digit numbers • Re-order addition to help with the calculation, e.g. 41+54, by adding 40 to 54, then 1 • Understand the effect of multiplying two-digit numbers by 10

SIS Math Scopes and Sequences

YEAR 4 LEARNING OUTCOMES

Data handling
Phase 3 Learners will continue to collect, organize, display and analyse data, developing an understanding of how different graphs highlight different aspects of data more efficiently. They will understand that scale can represent different quantities in graphs and that mode can be used to summarize a set of data. The learners will make the connection that probability is based on experimental events and can be expressed numerically. **Conceptual understandings:** ● Some events in daily life are more likely to happen than the others ● Probability can be based on experimental events in daily life ● Data can be collected, organized, displayed and analysed in different ways **Learners will develop an understanding that:** ● the concept of chance in daily events ● probability is based on experimental events ● data can be collected, displayed and interpreted using simple graphs, for example, bar graphs, line graphs ● scale can represent different quantities in graphs ● the mode can be used to summarize a set of data.
➔ **4Ss.01** Plan and conduct an investigation to answer statistical questions, considering what data to collect (categorical and discrete data). ➔ **4Ss.02** Record, organise and represent categorical and discrete data. Choose and explain which representation to use in a given situation: - Venn and Carroll diagrams - tally charts and frequency tables - pictograms and bar charts - dot plots (one dot per count). ➔ **4Ss.03** Interpret data, identifying similarities and variations, within and between data sets, to answer statistical questions. Discuss conclusions, considering the sources of variation. ➔ **4Sp.01** Use language associated with chance to describe familiar events, including reference to maybe, likely, certain, impossible. ➔ **4Sp.02** Conduct chance experiments, using small and large numbers of trials, and present and describe the results using the language of probability.

SIS Math Scopes and Sequences

Measurement

Phase 3:

Learners will continue to use standard units to measure objects, in particular developing their understanding of measuring perimeter, area and volume. They will select and use appropriate tools and units of measurement, and will be able to describe measures that fall between two numbers on a scale. The learners will be given the opportunity to construct meaning about the concept of an angle as a measure of rotation.

Conceptual understandings:

- 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

Learners will develop an understanding that:

- the use of standard units to measure, for example, length, mass, money, time, temperature
- measures can fall between numbers on a measurement scale, for example, 3½ kg, between 4 and 5 cm
- the relationship between units, for example, metres, centimetres and millimeters.

Area and perimeter:

➔ **4Gg.02** Estimate and measure perimeter and area of 2D shapes, understanding that two areas can be added together to calculate the area of a compound shape

➔ **4Gg.03 Draw** rectangles and squares on square grids, and measure their perimeter and area. Derive and use formula to calculate areas and perimeters of rectangles and squares.

➔ **4Gg.04** Estimate the area of irregular shapes on a square grid (whole and part squares).

Time:

➔ **4Gt.01** Understand the direct relationship between units of time, and convert between them

➔ **4Gt.02** Read and record time accurately in digital notation (12- and 24-hour) and on analogue clocks

➔ **4Gt.03** Interpret and use the information in timetables (12- and 24-hour clock).

➔ **4Gt.04** Find time intervals between different units:

- days, weeks, months and years
- seconds, minutes and hours that do not bridge through 60.

Angles

➔ **4Gg.08** Estimate, compare and classify angles, using geometric vocabulary including acute, right and obtuse.

SIS Math Scopes and Sequences

Shape and space
Phase 3 Learners will sort, describe and model regular and irregular polygons, developing an understanding of their properties. They will be able to describe and model congruence and similarity in 2D shapes. Learners will continue to develop their understanding of symmetry, in particular reflective and rotational symmetry. They will understand how geometric shapes and associated vocabulary are useful for representing and describing objects and events in real-world situations. **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 **Learners will develop an understanding that:** ● the common language used to describe shapes ● the properties of regular and irregular polygons ● an angle as a measure of rotation ● directions for location can be represented by coordinates on a grid ● geometric shapes are useful for representing real-world situations
Shape and geometric reasoning: ➔ **4Gg.01** Investigate what shapes can be made if two or more shapes are combined, and analyse their properties, including reference to tessellation ➔ **4Gg.05** Identify 2D faces of 3D shapes, and describe their properties ➔ **4Gg.06** Match nets to their corresponding 3D shapes ➔ **4Gg.07** Identify all horizontal, vertical and diagonal lines of symmetry on 2D shapes and patterns. ➔ **4Gp.03** Reflect 2D shapes in a horizontal or vertical mirror line, including where the mirror line is the edge of the shape, on square grids. **Position and movement:** ➔ **4Gp.01** Interpret and create descriptions of position, direction and movement, including reference to cardinal and ordinal points, and their notations. ➔ **4Gp.02** Understand that position can be described using coordinate notation. Read and plot coordinates in the first quadrant (with the aid of a grid).

SIS Math Scopes and Sequences

Pattern and function

Phase 3

Learners will analyse patterns and identify rules for patterns, developing the understanding that functions describe the relationship or rules that uniquely associate members of one set with members of another set. They will understand the inverse relationship between multiplication and division, and the associative and commutative properties of multiplication. They will be able to use their understanding of pattern and function to represent and make sense of real-life situations and, where appropriate, to solve problems involving the four operations.

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

Learners will develop an understanding that:

- patterns can be analysed and rules identified
- the inverse relationship between addition and subtraction
- the associative and commutative properties of addition
- multiplication is repeated addition and that division is repeated subtraction
- the inverse relationship between multiplication and division
- the associative and commutative properties of multiplication.

➔ **4Nc.04** Recognise and extend linear and non-linear sequences, and describe the term-to-term rule
➔ **4Nc.05** Recognise and extend the spatial pattern of square numbers.
➔ **4Ni.07** Understand the relationship between multiples and factors.
➔ **4Ni.08** Use knowledge of factors and multiples to understand tests of divisibility by 2, 5, 10, 25, 50 and 100

Number

Phase 3

Learners will develop the understanding that fractions and decimals are ways of representing whole-part relationships and will demonstrate this understanding by modelling equivalent fractions and decimal fractions to hundredths or beyond. They will be able to model, read, write, compare and order fractions, and use them in real-life situations. Learners will have automatic recall of addition, subtraction, multiplication and division facts. They will select, use and describe a range of strategies to solve problems involving addition, subtraction, multiplication and division, using estimation strategies to check the reasonableness of their 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 operation
- There are many mental methods that can be applied for exact and approximate computations

- ➔ **4Nc.01** Count on and count back in steps of constant size: 1-digit numbers, tens, hundreds or thousands, starting from any number, and extending beyond zero to include negative numbers.
- ➔ **4Ni.01** Read and write number names and whole numbers greater than 1000 and less than 0.
- ➔ **4Np.01** Understand and explain that the value of each digit in numbers is determined by its position in that number
- ➔ **4Np.02** Use knowledge of place value to multiply and divide whole numbers by 10 and 100
- ➔ **4Np.03 Compose**, decompose and regroup whole numbers
- ➔ **4Np.04** Understand the relative size of quantities to compare and order positive and negative numbers, using the symbols =, > and <.
- ➔ **4Np.05** Round numbers to the nearest 10, 100, 1000, 10 000 or 100 000.
- ➔ **4Nc.02** Recognise and explain generalisations when adding and subtracting combinations of even and odd numbers
- ➔ **4Nc.03** Recognise the use of objects, shapes or symbols to represent unknown quantities in addition and subtraction calculations
- ➔ **4Ni.02** Estimate, add and subtract whole numbers with up to three digits.
- ➔ **4Ni.03** Understand the associative property of multiplication, and use this to simplify calculations.
- ➔ **4Ni.04** Know all times tables from 1 to 10.
- ➔ **4Ni.05** Estimate and multiply whole numbers up to 1000 by 1-digit whole numbers.
- ➔ **4Ni.06** Estimate and divide whole numbers up to 100 by 1-digit whole numbers.
- ➔ **4Nf.01** Understand that the more parts a whole is divided into, the smaller the parts become
- ➔ **4Nf.02** Understand that a fraction can be represented as a division of the numerator by the denominator (unit fractions and three-quarters).
- ➔ **4Nf.03** Understand that unit fractions can act as operators
- ➔ **4Nf.04** Recognise that two proper fractions can have an equivalent value
- ➔ **4Nf.04** Recognise that two proper fractions can have an equivalent value
- ➔ **4Nf.05** Estimate, add and subtract fractions with the same denominator
- ➔ **4Nf.06** Understand percentage as the number of parts in each hundred, and use the percentage symbol (%)
- ➔ **4Nf.07** Use knowledge of equivalence to compare and order proper fractions, using the symbols =, > and <
- ➔ **4Gg.09** Use knowledge of fractions to read and interpret a measuring scale.

SIS Math Scopes and Sequences

YEAR 5 LEARNING OUTCOMES

Data handling
Phase 4 Learners will collect, organize and display data for the purposes of valid interpretation and communication. They will be able to use the mode, median, mean and range to summarize a set of data. They will create and manipulate an electronic database for their own purposes, including setting up spreadsheets and using simple formulas to create graphs. Learners will understand that probability can be expressed on a scale (0–1 or 0%–100%) and that the probability of an event can be predicted theoretically. **Conceptual understandings:** ● Probability can be based on experimental events in daily life ● Probability can be expressed in numerical notations ● Different graph forms highlight different aspects of data more efficiently **Learners will develop an understanding that:** ● probability is based on experimental events ● scale can represent different quantities in graphs ● the mode can be used to summarize a set of data ● different types of graphs have special purposes.
Probability: ➔ **5Sp.01** Use the language associated with likelihood to describe and compare likelihood and risk of familiar events, including those with equally likely outcomes ➔ **5Sp.02** Recognise that some outcomes are equally likely to happen and some outcomes are more (or less) likely to happen, when doing practical activities ➔ **5Sp.03** Conduct chance experiments or simulations, using small and large numbers of trials. Predict, analyse and describe the frequency of outcomes using the language of probability. **Organising, categorising and representing data:** ➔ **5Ss.01 Plan** and conduct an investigation to answer a set of related statistical questions, considering what data to collect (categorical, discrete and continuous data) ➔ **5Ss.02** Record, organise and represent categorical, discrete and continuous data. Choose and explain which representation to use in a given situation: - Venn and Carroll diagrams - tally charts and frequency tables - bar charts - waffle diagrams - frequency diagrams for continuous data - line graphs - dot plots (one dot per data point)

- ➔ **5Ss.03** Understand that the mode and median are ways to describe and summarise data sets. Find and interpret the mode and the median, and consider their appropriateness for the context
- ➔ **5Ss.04** Interpret data, identifying patterns, within and between data sets, to answer statistical questions. Discuss conclusions, considering the sources of variation.

Measurement

Phase 4:
Learners will understand that a range of procedures exists to measure different attributes of objects and events, for example, the use of formulas for finding area, perimeter and volume. They will be able to decide on the level of accuracy required for measuring and using decimal and fraction notation when precise measurements are necessary. To demonstrate their understanding of angles as a measure of rotation, the learners will be able to measure and construct angles.

Conceptual understandings:

- Standard units allow us to have a common language to identify, compare, order and sequence objects and events Objects and events have attributes that can be measured using appropriate tools
- Conversion of units and measurements allows us to make sense of the world we live in

Learners will develop an understanding that:

- the use of standard units to measure perimeter, area and volume
- measures can fall between numbers on a measurement scale, for example, 3½ kg, between 4 and 5 cm
- the unit conversions within the measurement system (metric or customary).

Area and perimeter:

- ➔ **5Gg.02** Estimate and measure perimeter and area of 2D shapes, understanding that shapes with the same perimeter can have different areas and vice versa
- ➔ **5Gg.07** Estimate, compare and classify angles, using geometric vocabulary including acute, right, obtuse and reflex.
- ➔ **5Gg.08** Know that the sum of the angles on a straight line is 180º and use this to calculate missing angles on a straight line.

Time:

- ➔ **5Gt.01 Understand** time intervals less than one second
- ➔ **5Gt.02** Compare times between time zones in digital notation (12- and 24-hour) and on analogue clocks
- ➔ **5Gt.03** Find time intervals in seconds, minutes and hours that bridge through 60
- ➔ **5Gt.04** Recognise that a time interval can be expressed as a decimal, or in mixed units.

SIS Math Scopes and Sequences

Shape and space

Phase 4
Learners will understand the properties of regular and irregular polyhedra. They will understand the properties of 2D shapes and understand that 2D representations of 3D objects can be used to visualize and solve problems in the real world, for example, through the use of drawing and modelling. Learners will develop their understanding of the use of scale (ratio) to enlarge and reduce shapes. They will apply the language and notation of bearing to describe direction and position.

Conceptual understandings:

- Changing the position of a shape does not alter its properties
- 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 reason

Learners will develop an understanding that:

- the common language used to describe shapes
- the properties of regular and irregular polygons
- the properties of regular and irregular polyhedra
- congruent or similar shapes
- lines and axes of reflective and rotational symmetry assist with the construction of shapes
- 2D representations of 3D objects can be used to visualize and solve problems
- an angle as a measure of rotation
- directions for location can be represented by coordinates on a grid.

Shape and geometric reasoning:

- ➔ **5Gg.01**Identify, describe, classify and sketch isosceles, equilateral or scalene triangles, including reference to angles and symmetrical properties
- ➔ **5Gg.04** Identify, describe and sketch 3D shapes in different orientations.
- ➔ **5Gg.05** Identify and sketch different nets for a cube.

Position and movement:

- ➔ **5Gp.01** Compare the relative position of coordinates (with or without the aid of a grid).
- ➔ **5Gp.02** Use knowledge of 2D shapes and coordinates to plot points to form lines and shapes in the first quadrant (with the aid of a grid).
- ➔ **5Gp.03** Translate 2D shapes, identifying the corresponding points between the original and the translated image, on square grids
- ➔ **5Gp.04 Reflect** 2D shapes in both horizontal and vertical mirror lines to create patterns on square grids
- ➔ **5Gg.06** Use knowledge of reflective symmetry to identify and complete symmetrical patterns.

SIS Math Scopes and Sequences

Pattern and function

Phase 4
Learners will understand that patterns can be represented, analysed and generalized using algebraic expressions, equations or functions. They will use words, tables, graphs and, where possible, symbolic rules to analyse and represent patterns. They will develop an understanding of exponential notation as a way to express repeated products, and of the inverse relationship that exists between exponents and roots. The students will continue to use their understanding of pattern and function to represent and make sense of real-life situations and to solve problems involving the four operations.

Conceptual understandings:

- Functions are relationships or rules that uniquely associate members of one set with members of another set
- Patterns can often be generalized using algebraic expressions, equations or functions

Learners will develop an understanding that:

- patterns can be generalized by a rule
- patterns can be represented, analysed and generalized using tables, graphs, words, and, when possible, symbolic rules
- the inverse relationship between addition and subtraction
- the associative and commutative properties of addition
- multiplication is repeated addition and that division is repeated subtraction
- the inverse relationship between multiplication and division
- the associative and commutative properties of multiplication

➔ **5Nc.03** Use the relationship between repeated addition of a constant and multiplication to find any term of a linear sequence
➔ **5Nc.04** Recognise and extend the spatial pattern of square and triangular numbers
➔ **5Ni.06** Understand and explain the difference between prime and composite numbers.
➔ **5Ni.07** Use knowledge of factors and multiples to understand tests of divisibility by 4 and 8.

Number

Phase 4
Learners will understand that the base 10 place value system extends infinitely in two directions and will be able to model, compare, read, write and order numbers to millions or beyond, as well as model integers. They will develop an understanding of ratios. They will understand that fractions, decimals and percentages are ways of representing whole-part relationships and will work towards modelling, comparing, reading, writing, ordering and converting fractions, decimals and percentages. They will use mental and written strategies to solve problems involving whole numbers, fractions and decimals in real-life situations, using a range of strategies to evaluate reasonableness of answers.

SIS Math Scopes and Sequences

Conceptual understandings:

- The base 10 place value system can be extended to represent magnitude
- 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
- The operations of addition, subtraction, multiplication and division are related to each other and are used to process information to solve problems
- ions can be modelled in a variety of ways, for example, an algorithm is a way to represent operation.

➔ **5Nc.01** Count on and count back in steps of constant size, and extend beyond zero to include negative numbers
➔ **5Ni.08** Use knowledge of multiplication to recognise square numbers (from 1 to 100).
➔ **5Np.01** Understand and explain the value of each digit in decimals (tenths and hundredths)
➔ **5Np.04** Compose, decompose and regroup numbers, including decimals (tenths and hundredths).
➔ **5Np.05** Round numbers with one decimal place to the nearest whole number
➔ **5Nc.01** Count on and count back in steps of constant size, and extend beyond zero to include negative numbers
➔ **5Nc.02** Recognise the use of objects, shapes or symbols to represent two unknown quantities in addition and subtraction calculations
➔ **5Ni.01** Estimate, add and subtract integers, including where one integer is negative.
➔ **5Ni.02** Understand which law of arithmetic to apply to simplify calculations
➔ **5Ni.03** Understand that the four operations follow a particular order
➔ **5Ni.04** Estimate and multiply whole numbers up to 1000 by 1-digit or 2-digit whole numbers
➔ **5Ni.05** Estimate an
➔ d divide whole numbers up to 1000 by 1-digit whole numbers.
➔ **5Np.02** Use knowledge of place value to multiply and divide whole numbers by 10, 100 and 1000
➔ **5Np.03** Use knowledge of place value to multiply and divide decimals by 10 and 100.
➔ **5Nf.09** Estimate, add and subtract numbers with the same number of decimal places
➔ **5Nf.10** Estimate and multiply numbers with one decimal place by 1-digit whole numbers.
➔ **5Nf.01** Understand that a fraction can be represented as a division of the numerator by the denominator (unit fractions, three-quarters, tenths and hundredths).
➔ **5Nf.02** Understand that proper fractions can act as operators
➔ **5Nf.03** Recognise that improper fractions and mixed numbers can have an equivalent value.
➔ **5Nf.04** Recognise that proper fractions, decimals (one decimal place) and percentages can have equivalent values.
➔ **5Nf.05** Estimate, add and subtract fractions with the same denominator and denominators that are multiples of each other
➔ **5Nf.06** Estimate, multiply and divide unit fractions by a whole number.
➔ **5Nf.07** Recognise percentages of shapes, and write percentages as a fraction with denominator 100
➔ **5Nf.08** Understand the relative size of quantities to compare and order numbers with one decimal place, proper fractions with the same denominator and percentages, using the symbols =, > and <
➔ **5Nf.11** Understand that:

- a proportion compares part to whole
- a ratio compares part to part of two or more quantities.

SIS Math Scopes and Sequences

YEAR 6 LEARNING OUTCOMES

Data handling

Phase 4
Learners will collect, organize and display data for the purposes of valid interpretation and communication. They will be able to use the mode, median, mean and range to summarize a set of data. They will create and manipulate an electronic database for their own purposes, including setting up spreadsheets and using simple formulas to create graphs. Learners will understand that probability can be expressed on a scale (0–1 or 0%–100%) and that the probability of an event can be predicted theoretically.

Conceptual understandings:

- Probability can be expressed in numerical notations
- Probability can be represented on a scale between 0-1 or 0%-100%
- The probability of an event can be predicted theoretically
- Data can be presented effectively for valid interpretation and communication Range, mode, median and mean can be used to analyse statistical data

Learners will develop an understanding that:

- probability can be expressed in scale (0-1) or per cent (0%-100%)
- there is the difference between experimental and theoretical probability
- different types of graphs have special purposes
- mode, median, mean and range can summarize a set of data
- one of the purposes of a database is to answer questions and/or solve problems

➔ 6Sp.01Use the language associated with probability and proportion to describe and compare possible outcomes.
➔ 6Sp.02 Identify when two events can happen at the same time and when they cannot, and know that the latter are called 'mutually exclusive'.
➔ **6Sp.03** Recognise that some probabilities can only be modelled through experiments using a large number of trials
➔ **6Sp.04** Conduct chance experiments or simulations, using small and large numbers of trials. Predict, analyse and describe the frequency of outcomes using the language of probability.
➔ **6Ss.01** Plan and conduct an investigation and make predictions for a set of related statistical questions, considering what data to collect (categorical, discrete and continuous data).
➔ **6Ss.02** Record, organise and represent categorical, discrete and continuous data. Choose and explain which representation to use in a given situation:

- Venn and Carroll diagrams
- tally charts and frequency tables
- bar charts

- waffle diagrams and pie charts
- frequency diagrams for continuous data
- line graphs
- scatter graphs
- dot plots

➔ **6Ss.04** Interpret data, identifying patterns within and between data sets, to answer statistical questions. Discuss conclusions, considering the sources of variation, and check predictions.

Measurement

Phase 4:

Learners will understand that a range of procedures exists to measure different attributes of objects and events, for example, the use of formulas for finding area, perimeter and volume. They will be able to decide on the level of accuracy required for measuring and using decimal and fraction notation when precise measurements are necessary. To demonstrate their understanding of angles as a measure of rotation, the learners will be able to measure and construct angles.

Conceptual understandings:

- Standard units allow us to have a common language to identify, compare, order and sequence objects and events.
- Accuracy of measurement 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.

Learners will develop an understanding that:

- the use of standard units to measure perimeter, area and volume
- the unit conversions within measurement system (metric or customary)
- the procedures for finding area, perimeter and volume
- the relationship between area and perimeter, between area and volume, and between volume and capacity
- an angle as a measure of rotation.

Area, perimeter and volume:

➔ **6Gg.03** Use knowledge of the area of rectangles to estimate and calculate the area of right-angled triangles.
➔ **6Gg.05** Understand the difference between capacity and volume.
➔ **6Gg.07** Understand the relationship between area of 2D shapes and surface area of 3D shapes.
➔ **6Gg.09** Classify, estimate, measure and draw angles
➔ **6Gg.10** Know that the sum of the angles in a triangle is 180º, and use this to calculate missing angles in a triangle.

SIS Math Scopes and Sequences

Shape and space

Phase 4
Learners will understand the properties of regular and irregular polyhedra. They will understand the properties of 2D shapes and understand that 2D representations of 3D objects can be used to visualize and solve problems in the real world, for example, through the use of drawing and modelling. Learners will develop their understanding of the use of scale (ratio) to enlarge and reduce shapes. They will apply the language and notation of bearing to describe direction and position.

Conceptual understandings:

- Manipulation of shape and space takes place for a particular reason
- 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

Learners will develop an understanding that:

- the common language used to describe shapes
- the properties of regular and irregular polygons
- the properties of regular and irregular polyhedra
- the properties of circles
- scale (ratios) is used to enlarge and reduce shapes
- systems for describing position and direction
- 2D representations of 3D objects can be used to visualize and solve problems
- visualization of shape and space is a strategy for solving problems
- geometric ideas and relationships can be used to solve problems in other areas of mathematics and in real life.

Shapes and geometric reasoning

- ➔ **6Gg.01** Identify, describe, classify and sketch quadrilaterals, including reference to angles, symmetrical properties, parallel sides and diagonals.
- ➔ **6Gg.02** Know the parts of a circle:
  - centre
  - radius
  - diameter
  - circumference
- ➔ **6Gg.04** Identify, describe and sketch compound 3D shapes.
- ➔ **6Gg.06** Identify and sketch different nets for cubes, cuboids, prisms and pyramids.
- ➔ **6Gg.07** Understand the relationship between area of 2D shapes and surface area of 3D shapes.
- ➔ **6Gg.08** Identify rotational symmetry in familiar shapes, patterns or images with maximum order 4. Describe rotational symmetry as 'order x'.

Position and movement

- ➔ **6gp01** Read and plot coordinates including integers, fractions and decimals, in all four quadrants (with the aid of a grid)

- ➔ **6gp02** Use knowledge of 2D shapes and coordinates to plot points to form lines and shapes in all four quadrants
- ➔ **6gp03** Translate 2D shapes, identifying the corresponding points between the original and the translated image, on coordinate grids
- ➔ **6gp04** Reflect 2D shapes in a given mirror line (vertical, horizontal and diagonal), on square grids
- ➔ **6Gp.05** Rotate shapes 90º around a vertex (clockwise or anticlockwise).

Pattern and function

Phase 4
Learners will understand that patterns can be represented, analysed and generalized using algebraic expressions, equations or functions. They will use words, tables, graphs and, where possible, symbolic rules to analyse and represent patterns. They will develop an understanding of exponential notation as a way to express repeated products, and of the inverse relationship that exists between exponents and roots. The students will continue to use their understanding of pattern and function to represent and make sense of real-life situations and to solve problems involving the four operations.

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

Learners will develop an understanding that:

- patterns can be generalized by a rule
- patterns can be represented, analysed and generalized using tables, graphs, words, and, when possible, symbolic rules
- the exponents as repeated multiplication
- the inverse relationship between exponents and roots

- ➔ **6Nc.03** Use the relationship between repeated addition of a constant and multiplication to find and use a position-to-term rule
- ➔ **6Nc.04** Use knowledge of square numbers to generate terms in a sequence, given its position
- ➔ **6Ni.02** Use knowledge of laws of arithmetic and order of operations to simplify calculations
- ➔ **6Ni.03** Understand that brackets can be used to alter the order of operations.
- ➔ **6Gt.01** Convert between time intervals expressed as a decimal and in mixed units.

SIS Math Scopes and Sequences

Number

Phase 4
Learners will understand that the base 10 place value system extends infinitely in two directions and will be able to model, compare, read, write and order numbers to millions or beyond, as well as model integers. They will develop an understanding of ratios. They will understand that fractions, decimals and percentages are ways of representing whole-part relationships and will work towards modelling, comparing, reading, writing, ordering and converting fractions, decimals and percentages. They will use mental and written strategies to solve problems involving whole numbers, fractions and decimals in real-life situations, using a range of strategies to evaluate reasonableness of answers.

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
- 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 operation.

➔ **6Nc.01** Count on and count back in steps of constant size, including fractions and decimals, and extend beyond zero to include negative numbers.
➔ **6Ni.02** Use knowledge of laws of arithmetic and order of operations to simplify calculations
➔ **6Ni.03** Understand that brackets can be used to alter the order of operations
➔ **6Np.01** Understand and explain the value of each digit in decimals (tenths, hundredths and thousandths)
➔ **6Np.02** Use knowledge of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000
➔ **6Np.03** Compose, decompose and regroup numbers, including decimals (tenths, hundredths and thousandths)
➔ **6Np.04** Round numbers with 2 decimal places to the nearest tenth or whole number.
➔ **6Gt.01** Convert between time intervals expressed as a decimal and in mixed units
➔ **6Nc.02** Recognise the use of letters to represent quantities that vary in addition and subtraction calculations.
➔ **6Ni.01** Estimate, add and subtract integers
➔ **6Ni.02** Use knowledge of laws of arithmetic and order of operations to simplify calculations
➔ **6Ni.04** Estimate and multiply whole numbers up to 10 000 by 1-digit or 2-digit whole numbers.
➔ **6Ni.05** Estimate and divide whole numbers up to 1000 by 1-digit or 2-digit whole numbers
➔ **6Ni.06** Understand common multiples and common factors.
➔ **6Ni.07** Use knowledge of factors and multiples to understand tests of divisibility by 3, 6 and 9
➔ **6Ni.08** Use knowledge of multiplication and square numbers to recognise cube numbers (from 1 to 125)
➔ **6Nf.09** Estimate, add and subtract numbers with the same or different number of decimal places
➔ **6Nf.10** Estimate and multiply numbers with one or two decimal places by 1-digit and 2-digit whole numbers
➔ **6Nf.11** Estimate and divide numbers with one or two decimal places by whole numbers.
➔ **6Nf.01** Understand that a fraction can be represented as a division of the numerator by the denominator (proper and improper fractions)
➔ **6Nf.02** Understand that proper and improper fractions can act as operators.
➔ **6Nf.03** Use knowledge of equivalence to write fractions in their simplest form

- **6Nf.04** Recognise that fractions, decimals (one or two decimal places) and percentages can have equivalent values
- **6Nf.05** Estimate, add and subtract fractions with different denominators.
- **6Nf.06** Estimate, multiply and divide proper fractions by whole numbers.
- **6Nf.07** Recognise percentages (1%, and multiples of 5% up to 100%) of shapes and whole numbers
- **6Nf.08** Understand the relative size of quantities to compare and order numbers with one or two decimal places, proper fractions with different denominators and percentages, using the symbols =, > and <
- **6Nf.12** Understand the relationship between two quantities when they are in direct proportion.

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