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## **MATHEMATICS in PYP**

### **Programme outline**

The study of Mathematics in every PYP grade is organised under **five Mathematics strands**:

- number
- pattern and function
- measurement
- shape and space
- data handling

For each strand **students are actively involved in constructing their own mathematical understanding through discovery and observation**. Mathematics is taught through **a hands-on approach** in which students are directed to gain knowledge by self-experience. The content of each strand has been organised into **four phases of development**, with each phase building upon and complementing the previous phase.

**Manipulatives**, **teaching problem solving** and **a summative assessment** are part and parcel of the teaching-learning process in our PYP.

**Manipulatives** are used to help students progress from the *concrete* to the *pictorial* to the *symbolic* levels of understanding of mathematical concepts. Students work in cooperative groups, individually or as a whole class. Teachers look for ways to challenge and stretch highly able Mathematics students laterally before moving vertically within the programme.

- *Virtual Maths manipulatives* are online and can be accessed using a desktop computer, laptop, iPad or interactive white board.
- *Printable Maths manipulatives* for teachers to print, cut, and assemble them are often used for students to support their progress and academic needs.
- *Plastic, Wooden, Foam Maths manipulatives* to e.g. grasp the meaning of 2D and 3D objects
- *Magnetic Math Manipulatives*

**In PYP teaching problem solving – Mathematical Modelling** – it is a way of connecting school mathematics with real-world problems. It requires one to present the real-world problem in a mathematical model involving negotiated variables from which the solution is derived.

**Summative Assessment** are practice tasks consolidating the learning for the lesson. Tasks are systematically varied to reinforce students' understanding.

## The study of **Mathematics in I. PYP AJ** organised under **five strands**:

Number	Pattern and function	Measurement	Shape and space	Data handling
<p>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.</p> <p><b>Whole Numbers/Place Values</b></p> <ul style="list-style-type: none"> <li>● Count within 100.</li> <li>● Read and write a number from 0 to 100 – the numeral and the corresponding number word.</li> <li>● Count on and backwards within 100.</li> <li>● Use number notation and place values (tens, ones).</li> <li>● Estimate the number of objects in a group of fewer than 100 objects.</li> <li>● Compare the number of objects in two or more sets.</li> <li>● Compare and order numbers within 100.</li> <li>● Find the number which is 1 or 10 more than (or less than) given number within 100.</li> <li>● Make a number story to illustrate a number bond for 5 to 10.</li> </ul>	<p>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.</p> <ul style="list-style-type: none"> <li>● Recognise, describe and extend patterns in numbers: counting by 2s, 5s and 10s</li> <li>● Identify patterns and rules for subtraction: <math>7 - 3 = 4</math>, <math>7 - 4 = 3</math></li> <li>● Model, with manipulatives, the relationship between addition and subtraction: <math>3 + 4 = 7</math>, <math>7 - 3 = 4</math>.</li> </ul>	<p>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.</p> <p><b>Length</b></p> <ul style="list-style-type: none"> <li>● Compare the lengths of two or more objects.</li> <li>● Arrange objects in order according to their lengths.</li> <li>● Estimate and measure the length of an object in non-standard units.</li> </ul> <p><b>Mass</b></p> <ul style="list-style-type: none"> <li>● Compare the masses of two objects. Compare and order the masses of three objects.</li> <li>● Estimate and measure the mass of an object in a non-standard unit.</li> </ul> <p><b>Time and calendar</b></p> <ul style="list-style-type: none"> <li>● Read a calendar: name the days of the week, the month of the year.</li> <li>● Read and write a date.</li> <li>● Tell time to the hour and half hour.</li> </ul>	<p>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.</p> <p><b>Plane Shapes</b></p> <ul style="list-style-type: none"> <li>● Recognize and name the four basic plane shapes (circle, triangle, rectangle, square).</li> <li>● Describe an object by its shape.</li> <li>● Count the sides and corners of a shape.</li> <li>● Classify a plane shape according to each of these attributes: shape, size and colour.</li> <li>● Continue a pattern of plane shapes according to one or two of these attributes: shape, size and colour.</li> <li>● Fit suitable pieces together to make a plane shape.</li> </ul> <p><b>Solid Shapes</b></p> <ul style="list-style-type: none"> <li>● Recognise and name a cube, cuboid, cone, cylinder and sphere.</li> <li>● Classify solid shapes according to each of these</li> </ul>	<p>Learners will develop an understanding of how the collection and organisation 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.</p> <p><b>Tally charts</b></p> <ul style="list-style-type: none"> <li>● Classify objects or people by a predetermined standard and count the numbers in each category.</li> <li>● Make and read a tally chart.</li> </ul> <p><b>Graphs</b></p> <ul style="list-style-type: none"> <li>● Make a simple picture graph using one-to-one representation.</li> <li>● Read and interpret a picture graph.</li> </ul>

- Write a number bond for 5 to 10.
- Name a position using an ordinal number from 1<sup>st</sup> to 10<sup>th</sup> and position words.

**Addition/ Subtraction**

- Use picture (or other manipulatives) to illustrate the meanings of addition and subtraction.
- Make a number story to a given addition or subtraction sentence.
- Write a number sentence for a given situation involving addition or subtraction.
- Observe the identity and commutative properties of addition.
- Observe the answer when 0 is subtracted from a number.
- Write a family of four addition and subtraction facts for a given number bond.
- Identify a double fact.
- Add or subtract within 100.
- Solve a 1-step word problem involving addition or subtraction of numbers within 20.
- Mentally add: two or three 1-digit whole numbers, a 1-digit whole number to a 2-digit whole number, and tens to a 2-digit whole number.
- Mentally subtract: a 1-digit whole number from another 1-digit whole

- Relate time to events of a day.
- Sequence events according to the time of the day.
- Describe estimated time relative to the hour and half past the hour.
- Compare durations using “longer” or “shorter”.

**Money**

- Recognize and name the coins and notes.
- Count and tell the amount of money.
- Exchange money.
- Count and tell the amount of money in a set of notes and coins.
- Compare the amount of money in euros and cents.
- Add or subtract amounts of money.

attributes: shape, size and colour.

- Identify a solid shape that can slide, stack or roll.
- Describe the relative position of a solid shape using position words.
- Continue a pattern of solid shapes according to one or two of these attributes: shape, size and colour.

number, a 1-digit whole number form a 2-digit whole number, tens from a 2-digit whole number.				
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## The study of Mathematics in II. PYP AJ organised under five strands:

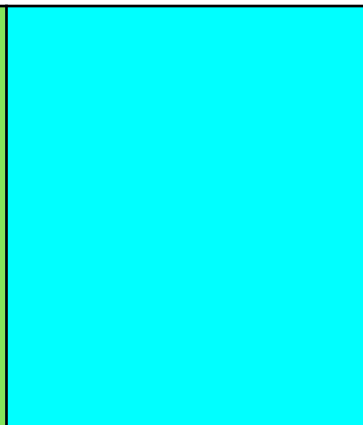
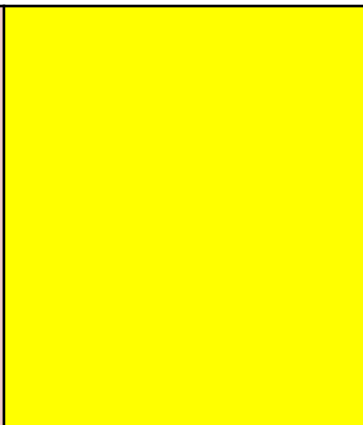
Numbers	Pattern and function	Measurement	Shape and space	Data handling
<p>Learners will understand that numbers are used for many different purposes in the real world. They will develop an understanding of one-to-one correspondence and conservation of number, and be able to count and use number words and numerals to represent quantities.</p> <p><b>Whole Numbers/ Place Values</b></p> <ul style="list-style-type: none"> <li>Count within 1 000.</li> <li>Read and write a number from 0 to 1000 – the numeral and the corresponding number word.</li> <li>Use number notation and place values (hundreds, tens, and ones).</li> <li>Estimate the number of objects in a group of fewer than 100 objects.</li> <li>Compare and order numbers within 1000.</li> <li>Use the symbols &lt; and &gt; for comparison of numbers.</li> <li>Find the number which is 1 or 10 or 100 more than (or less than) given a number within 1000.</li> </ul> <p><b>Addition / Subtraction</b></p> <ul style="list-style-type: none"> <li>Add or subtract within 1000.</li> <li>Use a part-whole bar model or a comparison bar model</li> </ul>	<p>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.</p> <ul style="list-style-type: none"> <li>Recognise, describe and extend patterns in numbers: counting by 2s, 3s, 4s, 5s and 10s</li> <li>Understand and use the relationship between multiplication and addition.</li> <li>Understand and use the relationship between division and subtraction.</li> <li>Model and explain number patterns.</li> </ul>	<p>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.</p> <p><b>Length</b></p> <ul style="list-style-type: none"> <li>Understand the need for standard units of measure of length.</li> <li>Understand that a metre is greater than a centimetre.</li> <li>Estimate and measure length in metres or centimetres.</li> <li>Compare lengths in metres or centimetres.</li> <li>Choose an appropriate unit of measure when measuring lengths.</li> <li>Measure the length of a line segment in centimetres.</li> <li>Draw a line segment of a given length.</li> <li>Solve up to 2-step word problems involving length.</li> </ul> <p><b>Mass</b></p> <ul style="list-style-type: none"> <li>Understand the need for standardised units of measure of mass.</li> </ul>	<p>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.</p> <p><b>Plane Shapes</b></p> <ul style="list-style-type: none"> <li>Identify a semicircle and a quarter circle.</li> <li>Identify and name basic shapes that make up a new shape.</li> <li>Fit cutouts of shapes together to make a new shape.</li> <li>Copy a figure on a dot grid or square grid.</li> <li>Continue a pattern of plane shapes according to one or two of these attributes: shape, size, colour and orientation.</li> </ul> <p><b>Solid Shapes</b></p> <ul style="list-style-type: none"> <li>Identify the flat and curved surfaces of a solid object in the shape of a cube, cuboid, cone, cylinder and sphere.</li> <li>Identify the faces, edges and vertices of a solid object in the shape of a cube, cuboid, cone, cylinder and sphere.</li> </ul>	<p>Learners will develop an understanding of how the collection and organisation 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.</p> <p><b>Tally charts</b></p> <ul style="list-style-type: none"> <li>Use a tally chart to gather data and represent data in a picture graph.</li> </ul> <p><b>Graphs</b></p> <ul style="list-style-type: none"> <li>Use a tally chart to gather data and represent data in a picture graph.</li> <li>Make a picture graph with scale.</li> <li>Read and interpret a picture graph.</li> <li>Solve problems using data presented in a picture graph.</li> </ul>

<p>to represent an addition or subtraction situation.</p> <ul style="list-style-type: none"> <li>● Solve a 2-step word problem involving addition or subtraction of numbers.</li> <li>● Find the missing part or whole in a subtraction sentence.</li> <li>● Mentally add: a 1-digit whole number to a 2-digit whole number with regrouping, two 2-digit whole numbers without regrouping, ones, tens or hundreds to a 3-digit whole number, 99 or 98 to a number up to 3 digits</li> <li>● Mentally subtract: a 1-digit whole number from a 2-digit whole number with regrouping, a 2-digit whole number from another 2-digit whole number without regrouping, ones, tens or hundreds from a 3-digit whole number, 99 or 98 to a 3-digit whole number.</li> </ul> <p><b>Multiplication / division</b></p> <ul style="list-style-type: none"> <li>● Recognize equal groups and find the total number in the groups by repeated addition.</li> <li>● Use mathematical language such as – 4 threes and 2 groups of 5 to describe equal groups.</li> <li>● Use manipulatives to illustrate the meaning of multiplication and the sharing and grouping concepts of division.</li> </ul>		<ul style="list-style-type: none"> <li>● Measure mass in kilograms or grams.</li> <li>● Compare masses in kilograms or grams.</li> <li>● Solve up to 2-step word problems involving length.</li> </ul> <p><b>Time and calendar</b></p> <ul style="list-style-type: none"> <li>● Read a calendar: name the days of the week, the month of the year.</li> <li>● Understand the relationship between 1 hour, 1 day, 1 week, 1 month and 1 year.</li> <li>● Tell and write time to 5 minutes.</li> <li>● Use am and pm in telling time.</li> <li>● Relate time to events of a day.</li> <li>● Find the duration of a time interval.</li> <li>● Develop a sense of the duration of daily activities.</li> <li>● Solve word problems involving time.</li> </ul> <p><b>Money</b></p> <ul style="list-style-type: none"> <li>● Recognize and name the coins and notes.</li> <li>● Count and tell the amount of money.</li> <li>● Exchange money.</li> <li>● Count and tell the amount of money in a set of notes and coins.</li> <li>● Compare the amount of money in euros and cents.</li> <li>● Add or subtract amounts of money.</li> <li>● Solve 1-step word problems involving money.</li> </ul>	<ul style="list-style-type: none"> <li>● Use solid shapes to form different solid figures.</li> <li>● Continue a pattern of solid shapes according to one or two of these attributes: shape, size, colour and orientation.</li> </ul> <p><b>Line Segments</b></p> <ul style="list-style-type: none"> <li>● Identify a line segment and a curve.</li> </ul>	
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- Make a number story for a given multiplication or division sentence.
- Write a number sentence for a given situation involving multiplication or division.
- Work out a multiplication fact within 40 by repeated addition.
- Solve 1-step picture problem involving multiplication or division.
- Write a family of four multiplication facts and division facts.
- Write an additional double as a multiplication fact. Observe commutative and distributive properties of multiplication.
- Build up the multiplication tables of 2, 3, 4, 5 and 10 and commit the multiplication facts to memory.
- Use a related multiplication fact to divide.
- Multiply or divide numbers within the multiplication tables of 2, 3, 4, 5 and 10.
- Use a part-whole bar model to represent a multiplication or division situation (note: use any model other than the bar model).
- Solve a 1-step word problem involving multiplication or division using the multiplication tables of 2, 3, 4, 5, and 10.

**Fractions**

- Recognize and name a unit fraction up to  $1/12$ .
- Recognize and name a fraction of a whole which is divided into equal parts.
- Find the fraction that must be added to a given fraction to make a whole.
- Compare and order unit fractions (follow-up in III.PYP AJ).





## The study of **Mathematics in III. PYP AJ** organised under **five strands**:

Numbers	Pattern and function	Measurement	Shape and space	Data handling
<p>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.</p> <p><b>Whole Numbers / Place Values</b></p> <ul style="list-style-type: none"> <li>• Read and write a number within 10 000 – the numeral and the corresponding number word.</li> <li>• Use number notation and place values (thousands, hundreds, tens, ones).</li> </ul>	<p>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.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Recognise, describe and extend patterns in numbers: counting by 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s and 10s.</li> <li>• Understand and use the relationship between multiplication and addition.</li> </ul>	<p>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.</p> <p><b>Length</b></p> <ul style="list-style-type: none"> <li>• Understanding kilometre vs metre/ metre vs millimetre/ millimetre vs centimetre.</li> <li>• Measure and compare lengths in kilometres, metres, centimetres and millimetres.</li> <li>• Convert a measurement of length from compound units to a smaller unit, and vice versa.</li> <li>• Add or subtract lengths in compound units.</li> <li>• Solve up to 2-steps word problems involving length.</li> </ul> <p><b>Perimeter / Area</b></p>	<p>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.</p> <p><b>Plane and Solid Shapes</b></p> <ul style="list-style-type: none"> <li>• Sort, describe, construct and model regular and irregular polygons: hexagons, trapeziums</li> <li>• Identify, describe and model congruence in 2D shapes.</li> <li>• Combine and transform 2D shapes to make another shape.</li> <li>• Construct regular 3D shapes from nets made up of 2D shapes</li> <li>• Identify lines and axes of rotational symmetry.</li> </ul>	<p>Learners will continue to collect, organise, 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 summarise a set of data. The learners will make the connection that probability is based on experimental events and can be expressed numerically.</p> <p><b>Graphs</b></p> <ul style="list-style-type: none"> <li>• Read and interpret a block and bar graph.</li> <li>• Solve problems using data present in a bar graph.</li> </ul>

<ul style="list-style-type: none"> <li>• Estimate the number of objects in a group of fewer than 100 objects.</li> <li>• Compare and order numbers within 10 000.</li> <li>• Find the number which is 1, 10, 100 or 1000 more than (or less than) given number within 10 000.</li> <li>• Identify odd and even numbers.</li> </ul> <p><b>We are already rounding.</b></p> <p><b>Addition / Subtraction</b></p> <ul style="list-style-type: none"> <li>• Associate the terms sum and difference with addition and subtraction respectively.</li> <li>• Add or subtract within 10 000.</li> <li>• Use a part-whole bar model or a comparison bar model to represent an addition or subtraction situation.</li> <li>• Solve up to 2-step word problems involving addition or subtraction.</li> <li>• Mentally add two or three 2-digit whole numbers with regrouping.</li> <li>• Mentally subtract a 2-digit whole number from another 2-digit whole number with regrouping.</li> </ul> <p><b>Multiplication / Division</b></p> <ul style="list-style-type: none"> <li>• Multiply a number by zero.</li> <li>• Count by sixes, sevens, eights, and nines.</li> <li>• Introduction to multiplication properties.</li> </ul>	<ul style="list-style-type: none"> <li>• Understand and use the relationship between division and subtraction.</li> <li>• Model and explain number patterns.</li> </ul>	<ul style="list-style-type: none"> <li>• Measure in non-standard units (unusual measures like finger, hand, palm, etc.)</li> <li>• Compare the areas of figures made up of unit squares and half squares and half squares.</li> <li>• Visualise the sizes of 1 square centimetre and 1 square metre.</li> <li>• Find the area of a figure made up of 1-centimetre or 1-metre squares and half-squares.</li> <li>• Compare the areas of figures made up of 1-centimetre or 1-metre square.</li> </ul> <p><b>Volume</b></p> <ul style="list-style-type: none"> <li>• Understand the concept of volume.</li> <li>• Compare volumes of liquid in two or more containers in non-standard units.</li> <li>• Measure and compare a volume of liquid in litres and millilitres.</li> <li>• Tell the difference between volume and capacity. Compare capacities of two or more containers.</li> <li>• Convert litres and millilitres to millilitres, and vice versa.</li> <li>• Add or subtract volumes in litres and millilitres.</li> <li>• Solve up to 2-steps word problems involving volume and capacity.</li> </ul> <p><b>Mass</b></p> <ul style="list-style-type: none"> <li>• Measure mass in kilograms and grams.</li> </ul>	<ul style="list-style-type: none"> <li>• Understand an angle as a measure of rotation and identify right angles, obtuse and acute angles in 2D shapes.</li> <li>• Use directional language and coordinates to describe positions.</li> </ul> <p><b>Line Segment</b></p> <ul style="list-style-type: none"> <li>• Identify perpendicular and parallel line segments.</li> <li>• Draw perpendicular and parallel line segments on a square grid.</li> <li>• Identify horizontal and vertical line segments.</li> </ul> <p><b>Angles</b></p> <ul style="list-style-type: none"> <li>• Understand the terms point, line, line segment, ray and angle.</li> <li>• Compare size of angles.</li> <li>• Identify angles on objects, in a shape, and identify the right angle.</li> <li>• Tell whether a given angle is equal to, smaller than or bigger than a right angle.</li> </ul>	
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- Build up the multiplication tables of 6, 7, 8, and 9 and commit the multiplication facts to memory.
- Multiply or divide numbers within the multiplication tables of 6, 7, 8, and 9.
- Associate the term product with multiplication and terms quotient and remainder with division.
- Multiply or divide a whole number up to 3 digits by 2, 3, 4, or 5.
- Use a part-whole bar model or a comparison bar model to represent a multiplication or division situation.
- Solve up to 2-steps word problems involving multiplication and division.
- Mentally multiply or divide tens or hundreds by a 1-digit whole number.

#### **Fractions**

- Identify the numerator and denominator of a fraction. Compare and order fractions which have a common numerator or denominator.
- Recognize and name equivalent fractions of a given fraction with denominator up to 12.
- Introduction to expressing the fraction in its simplest form (follow up in IV.PYP)
- Add or subtract like and related fractions within 1 whole.

- Convert kilogram and grams into grams and vice versa.
- Compare, add or subtract masses in kg and g.
- Solve up to 2-step word problems involving mass.

#### **Time and calendar**

- Express years and months in months, and week in days, and vice versa.
- Tell and write time to 1 minute.
- Find the duration of a time interval.
- Convert hours and minutes to minutes, and vice versa. Add or subtract in hours and minutes.
- Solve word problems involving time.

- Solve a 1-step word problem involving fraction



The study of **Mathematics in IV. PYP AJ** organised under **five strands:**

<b>Numbers</b>	<b>Pattern and function</b>	<b>Measurement</b>	<b>Shape and space</b>	<b>Data handling</b>
<p>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.</p> <p><b>Whole Numbers / Place Values</b></p> <ul style="list-style-type: none"> <li>• Read and write a number within 100 000 – the numeral and the corresponding number word.</li> <li>• Use number notations and place values (ten thousands, thousands, hundreds, tens, ones)</li> <li>• Compare the number of objects in two or more sets.</li> <li>• Compare and order numbers within 100 000.</li> <li>• Find the number which is 1 or 10, 100, 1 000, 10 000 more than (or less than) a given number within 100 000.</li> <li>• Read a number line.</li> <li>• Round a whole number to the nearest ten or hundred.</li> </ul> <p><b>Addition / Subtraction</b></p>	<p>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.</p> <ul style="list-style-type: none"> <li>• Understand and use the relationship between multiplication and addition.</li> <li>• Understand and use the relationship between division and subtraction.</li> <li>• Model and explain number patterns.</li> <li>• Use a real life problem to create a number pattern, following a rule (a number pattern visible in the environment).</li> </ul>	<p>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.</p> <p><b>Perimeter / Area</b></p> <ul style="list-style-type: none"> <li>• Find a perimeter of a figure made up of 1-centimetre of 1-metre squares.</li> <li>• Measure the perimeter of a figure.</li> <li>• Compare the areas and perimeters of figures made up of 1-centimetre of 1-metre squares.</li> <li>• Find the perimeter of a rectilinear figure given the lengths of all its sides.</li> <li>• Find the area and perimeter of a square given the length of one side.</li> <li>• Find the area and perimeter of a rectangle given its length and breadth.</li> <li>• Find one side of a rectangle given the other side and its area of perimeter.</li> </ul>	<p>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.</p> <p><b>Plane Shapes</b></p> <ul style="list-style-type: none"> <li>• Understand the properties of squares and rectangles.</li> <li>• Use properties of squares and rectangles to find unknown angle measures.</li> <li>• Use properties of squares and rectangles to find unknown lengths.</li> <li>• Identify a symmetric figure.</li> <li>• Cut out a symmetric figure from a piece of folded paper.</li> <li>• Determine whether a line is a line of symmetry of a figure.</li> <li>• Complete a symmetric figure with respect to a given horizontal or vertical line of symmetry.</li> <li>• Make a symmetric pattern.</li> </ul> <p><b>Line Segments</b></p> <ul style="list-style-type: none"> <li>• Draw perpendicular and parallel line segments.</li> </ul> <p><b>Angles</b></p>	<p>Learners will develop an understanding of how the collection and organisation 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.</p> <p><b>Graphs</b></p> <ul style="list-style-type: none"> <li>• Complete a bar graph with given data.</li> <li>• Solve problems using data presented in a bar graph.</li> <li>• Make a line graph.</li> <li>• Read and interpret a line graph.</li> <li>• Solve problems using data presented in a line graph.</li> <li>• Compare bar graphs and a line graph to understand the properties and uses of each type of graph.</li> </ul> <p><b>Tables</b></p> <ul style="list-style-type: none"> <li>• Present data in a table.</li> <li>• Read and interpret a table.</li> <li>• Solve problems using data presented in a table.</li> </ul>

- Estimate an answer in addition or subtraction.
- Check the reasonableness of an answer in addition or subtraction.

### **Multiplication / Division**

- List all factors of a whole number up to 100.
- Find out if a 1-digit whole number is a factor of a given whole number.
- List the multiples of a whole number up to 10.
- Introduction to factors and multiples.
- Find out if a whole number is a multiple of a given whole number.
- Identify multiples of 2, 5 and 10.
- Observe the associative property (grouping) of a multiplication.
- Apply the commutative (order) and associative properties of multiplication in computation.
- Multiply or divide a 4 –digit whole number by a 1–digit whole number.
- Multiply or divide a whole number up to 4 digits by 10.
- Multiply a whole number up to 3 digits by a 2-digit whole number.
- Estimate an answer in multiplication or division.
- Check the reasonableness of an answer in multiplication or division.

- Find the length of one side of a square given its area or perimeter.
- Find the area and perimeter of a figure made up of squares and/or rectangles.
- Solve word problems involving area and perimeter of figures made up of squares and/or rectangles.

### **Time and clock**

- Tell time to the second.
- Find the duration of a time interval.
- Convert minutes and seconds to seconds, and vice versa.
- Tell time using the 24-hour clock notation.
- Convert time between the 12-hour and 24-hour clock notations.
- Solve word problems involving time in the 24-hour clock notation.

- Use notations such as  $\angle$  ABC and  $\angle$  x.
- Recognize that the measure of a right angle is  $90^\circ$ .
- Estimate and measure the size of an angle in degrees.
- Draw an angle.
- Relate turns to right angles.
- Relate a  $\frac{1}{4}$  turn with  $90^\circ$  a  $\frac{1}{2}$  turn with  $180^\circ$ , a  $\frac{3}{4}$  turn with  $270^\circ$  and a complete turn with  $360^\circ$ .
- Tell a direction to the 8-point compass.
- Read a simple map.
- Understand the properties of squares and rectangles.
- Use properties of squares and rectangles to find unknown angle measures.

- Solve up to 3-step word problems involving multiplication and division.

### **Fractions**

- Write the sum of a whole number and a proper fraction as a mixed number.
- Read a number line involving fractions and mixed numbers.
- Interpret an improper fraction as a multiple of a unit fraction.
- Write a whole number of a mixed number as an improper fraction and vice versa.
- Add two or three like or related fractions with a sum more than 1 whole.
- Subtract one or two fractions from a whole number.
- Understand a fraction of a set of objects.
- Find the value of a fractional part of a quantity.
- Multiply a fraction and a whole number.
- Express a part of a quantity as a fraction.
- Solve word problems involving fractions.

### **Decimals**

- Read and write a decimal up to 3 decimal places.
- Express a fraction or mixed number whose denominator is a factor of 10, 100 or 1 000 as a decimal.

- Interpret a decimal up to 3 decimal places in terms of ones, tenths, hundredths, and thousandths.
- Express a decimal up to 3 decimal places as a fraction or mixed number in its simplest form.
- Read a number line involving decimals.
- Solve up to 3-step word problems involving multiplication and division.
- Compare and order decimals up to 3 decimal places.
- Compare and order whole numbers, decimals and fractions.
- Round a decimal to the nearest whole number or to 1 decimal place.



The study of **Mathematics in V. PYP AJ** organised under **five strands**:

Numbers	Pattern and function	Measurement	Shape and space	Data handling
<p>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.</p> <p><b>Whole Numbers / Place Values</b></p> <ul style="list-style-type: none"> <li>● Read and write a number within 100 000 000 – the numeral and the corresponding number word.</li> <li>● Identify the values of digits in a number within 1 000 000.</li> <li>● Round a whole number to the nearest thousand, ten thousand, hundred thousand, million, ten million or hundred million.</li> </ul> <p><b>Addition / Subtraction</b></p> <ul style="list-style-type: none"> <li>● Estimate an answer in addition or subtraction.</li> </ul>	<p>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.</p> <ul style="list-style-type: none"> <li>● Understand and use the relationship between multiplication and division.</li> <li>● Understand and use exponents, order of operations.</li> </ul>	<p>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. They will use measuring tools and read scales accurately and understand that the accuracy of a measurement depends on the situation and the precision of the tools.</p> <p><b>Length</b></p> <ul style="list-style-type: none"> <li>● Convert a measurement of length from a larger unit of measure involving a decimal to a smaller unit and vice versa.</li> <li>● Convert a measurement of length from a larger unit of measure involving a decimal to compound units and vice versa.</li> </ul>	<p>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.</p> <p><b>Plane Shapes</b></p> <ul style="list-style-type: none"> <li>● Understand and use geometric vocabulary for circles: diameter, radius and circumference, chord.</li> <li>● Use a pair of compasses to construct a circle of a given radius.</li> <li>● Classify, sort and label all types of polygons.</li> <li>● Identify a symmetric figure.</li> <li>● Identify all lines of symmetry in a given shape.</li> <li>● Describe, classify and model 3-D shapes.</li> <li>● Find and use scale (ratios) to enlarge and reduce shapes and to</li> </ul>	<p>Learners will develop an understanding of how the collection and organisation 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.</p> <p><b>Graphs</b></p> <ul style="list-style-type: none"> <li>● Design a survey and systematically collect, organise and record the data in displays: tally chart, bar graphs, line graphs, simple pie chart, stem + leaf plot.</li> <li>● Create, interpret, compare and evaluate data displays (bar/line graphs, pie charts, Venn diagrams, etc.) to determine how well they communicate information.</li> <li>● Find, describe and explain the mean, range, median, mode in a set of</li> </ul>

<ul style="list-style-type: none"> <li>• Do mixed operations and subtraction without parentheses.</li> <li>• Do mixed operations involving addition, subtraction, multiplication and division without or with parentheses.</li> <li>• Solve a multi-step word problem involving the four operations of whole numbers.</li> </ul> <p><b>Multiplication / Division</b></p> <ul style="list-style-type: none"> <li>• Estimate an answer in multiplication or division.</li> <li>• Find the common factors and greatest common factor of two numbers.</li> <li>• Find out if a number is a common factor of two given numbers.</li> <li>• Find the common multiples and least common multiple of two numbers.</li> <li>• Find out if a number is a common multiple of two given numbers.</li> <li>• Multiply or divide a whole number by 10, 100, 1000.</li> <li>• Multiply or divide a whole number by tens, hundreds or thousands.</li> </ul>	<ul style="list-style-type: none"> <li>• Complete and create simple algebraic number sentences (<math>2x = 4</math>).</li> <li>• Understand and solve simple equations, expressions.</li> </ul> <p><b>Expressions</b></p> <ul style="list-style-type: none"> <li>• Use letters to represent unknown numbers.</li> <li>• Write a simple algebraic expression in one variable.</li> <li>• Find the value of a simple algebraic expression using substitution.</li> <li>• Simplify an algebraic expression in one variable.</li> <li>• Solve a word problem by forming an algebraic expression.</li> </ul>	<p><b>Perimeter / Area</b></p> <ul style="list-style-type: none"> <li>• Use a formula for finding the area of quadrilaterals and triangles.</li> <li>• Measure the perimeter of a figure.</li> <li>• Determine the relationship between area, perimeter and volume.</li> <li>• Identify the base and height of a triangle.</li> <li>• Find the area of a figure related to the area of a triangle.</li> </ul> <p><b>Volume</b></p> <ul style="list-style-type: none"> <li>• Convert a measurement of volume of liquid from a larger unit of measure involving a decimal to a smaller unit and vice versa.</li> <li>• Convert a measurement of volume of liquid from a larger unit of measure involving a decimal to compound units and vice versa.</li> <li>• Visualise a solid that is made up of unit cubes and state its volume in cubic units.</li> <li>• Visualise the sizes of 1 cubic centimetre and 1 cubic metre.</li> </ul>	<p>make and interpret maps and diagrams.</p> <ul style="list-style-type: none"> <li>• Determine whether a line is a line of symmetry of a figure.</li> <li>• Complete a symmetric figure with respect to a given horizontal or vertical line of symmetry.</li> <li>• Make a symmetric pattern.</li> <li>• Read and plot coordinates in four quadrants.</li> <li>• Recognise that the sum of the angle measures in a triangle is <math>180^\circ</math>.</li> <li>• Find an unknown angle measure in a triangle given the other two angles measures.</li> <li>• Identify a right triangle.</li> <li>• Recognise that when one angle of a triangle is a right angle, the sum of the measures of the other two angles is <math>90^\circ</math>.</li> <li>• Recognise that the measure of the exterior angle of a triangle is equal to the sum of the measures of the interior opposite angles.</li> <li>• Find an unknown angle measure in a triangle is equal to the sum of the</li> </ul>	<p>data and understand its use.</p> <ul style="list-style-type: none"> <li>• Use a numerical probability scale 0 to 1.</li> </ul> <p><b>Tables</b></p> <ul style="list-style-type: none"> <li>• Present data in a table.</li> <li>• Read and interpret a table.</li> <li>• Solve problems using data presented in a table.</li> </ul>
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- Do mixed operations involving multiplication and division without parentheses.
- Do missed operations involving addition, subtraction, multiplication and division without or with parentheses.
- Multiply a 4-digit whole number by a 2-digit whole number.
- Divide a whole number up to 4 digits by a 2-digit whole number.
- Solve a multi-step word problem involving the four operations of whole numbers.

#### Integers

- Divide a whole number by an integer.
- Read, write and model addition and subtraction of integers.
- Select and defend the most appropriate and efficient method of solving a problem: mental estimation, mental arithmetic, pencil and paper algorithm, calculator.

- Find the volume of a solid made up of 1-centimetre and 1-metre cubes.
- Find the volume of a cuboid given its length, breadth and height.
- Convert from one unit of measure of volume to another.
- Calculate the surface area and volume of different solids.
- Find the capacity of cubic or rectangular containers.
- Find the length of one edge of a cube given its volume.
- Find the length of one edge of a cuboid given its volume and two other edges.
- Find the length of one edge of a cuboid given its area of one face and its volume.
- Solve word problems involving volume of water in a cubic or rectangular container.

#### Mass

- Convert a measurement of mass from a larger unit of measure involving

measures of the interior opposite angles.

- Find an unknown angle measure in a triangle involving an exterior angle.
- Identify an isosceles triangle and an equilateral triangle.
- Draw a triangle, rectangle, square, parallelogram, rhombus or trapezoid given the measurements.
- Identify the unit shape in a tessellation.
- Identify if a given shape can tessellate.
- Make different tessellations with a unit shape.
- Draw a tessellation on dot paper.
- Make a tessellation with two different shapes.

#### Solid shapes

- Build a solid with unit cubes.
- Visualise a solid drawn on dot paper and state the number of unit cubes used to build the solid.
- Identify the front, top and side views of a solid.

#### Angles

### Fractions

- Associate a fraction with division.
- Express an improper fraction as a whole number, mixed number or decimal.
- Divide a whole number by another whole number and write the quotient as a mixed number.
- Add or subtract unlike fractions and mixed numbers.
- Multiply fractions.
- Multiply a whole number by a mixed number.
- Multiply a fraction of mixed numbers by a mixed number.
- Divide a fraction by a whole number.
- Divide a whole number by a fraction.
- Solve a multi-step word problem involving fractions.

### Decimals

- Round a decimal to a given place.
- Divide a decimal by a 1-digit whole number and round the quotient to 2 decimal places.

- a decimal to a smaller unit and vice versa.
- Convert a measurement of mass from a larger unit of measure involving a decimal to compound units and vice versa.

### Time and clock

- Tell time to the second.
- Calculate an elapsed time.

- Use notations such as  $\sphericalangle$  ABC and  $\sphericalangle$  x.
- Measure and construct angles in degrees using a protractor.
- Recognise that the sum of the angle measures on a line is  $180^\circ$ .
- Recognise that the sum of the angle measures at a point is  $360^\circ$ .
- Recognise that vertically opposite angles have equal measures.
- Find the unknown measure of an angle involving angles on a line, angles at a point and vertically opposite angles.
- Recognize that the sum of the angle measures in a triangle is  $180^\circ$ .
- Find an unknown angle measure in a triangle given the other two angle measures.
- Recognise that when one angle of a triangle is a right angle, the sum of the measures of the other two angles is  $90^\circ$ .
- Recognize that the measure of the exterior angle of a triangle is equal to the sum of the measures of the interior angle.

- Express a missed number as a decimal correct to 2 decimal places.
- Multiply or divide a decimal or a whole number by 10, 100, 1000.
- Multiply or divide a decimal or a whole number by tens, hundreds or thousands.
- Multiply a decimal up to 2 decimal places by a 2-digit whole number.
- Multiply a decimal up to 2 decimal places by a decimal with 1 decimal place.
- Estimate an answer in multiplication.
- Check the reasonableness of an answer in multiplication.
- Convert a measurement of length, mass or volume of liquid from a larger unit of measure involving a decimal to a smaller unit and vice versa.
- Convert a measurement of length, mass or volume of liquid from a larger unit of measure involving a decimal to

- Recognise that the angles opposite the equal sides of a triangle have equal measures.
- State and apply the properties of parallelograms, rhombuses and trapezoids.

compound units and vice versa.

- Solve a multi-step word problem involving the four operations of decimals.
- Interchange fractions, percentages and decimals.

#### **Percentages**

- Read and interpret a percentage of a whole.
- Express a fraction as a percent and vice versa.
- Express a decimal as a percent, and vice versa.
- Express a part of a whole as a percent.
- Understand that 1 whole as 100%.
- Find the value of a percentage of a quantity.
- Solve up to 2-step word problems involving percentage interest, tax and discount.

#### **Rate**

- Find the rate by expressing one quantity per unit of another quantity.
- Find a quantity using the given rate.

- Solve multi-step word problems involving rate.

**Ratio**

- Use a ratio to compare two or three quantities.
- Use a comparison bar model to show a ratio.
- Use a ratio to compare two quantities given in a comparison bar model.
- Write equivalent ratios.
- Write a ratio in its simplest form.
- Find a missing term in a pair of equivalent ratios.
- Solve a multi-step word problem involving ratio.
- Find and use scale (ratios) to enlarge and reduce shapes and to make and interpret maps and diagrams.