MATHEMATICS

The MYP mathematics framework is based on the expectation that students in MYP year 1 have at least five years of prior mathematics experience and are familiar with the following topics and skills. Teachers must therefore ensure that any skills listed here that are unknown to their students at the start of the course are included at an early stage. Teachers should also take into account the existing mathematical knowledge of their students in designing an appropriate course of study for mathematics *(MYP Mathematics Guide, 2022)*.

To work towards the MYP mathematics objectives and develop the skills in the mathematics framework, students should be able to:

- use the base 10 place value system to represent the magnitude of very large and very small quantities
- use the associative and commutative properties to express quantities and expressions in multiple equivalent forms
- use the relationships between the operations of addition, subtraction, multiplication and division in order to process information to solve problems
- use fractions and decimals to represent whole-part relationships
- model complex operations in a variety of ways, such as algorithms or flow charts
- analyse and identify rules for patterns
- use functions or rules to extend patterns and describe patterns
- apply a range of procedures to measure different attributes of objects and events
- describe the accuracy of measurements with reference to the situation and the precision of the tool
- convert units and measurements to describe the world we live in in terms that make sense
- transform shapes using rotation,reflection and translation
- use geometric vocabulary to show that changing the position of a shape does not alter its properties
- use geometric shapes and vocabulary useful to represent and describe objects and events in real-world situations
- collect, organize, display and interpret data in different ways
- use different graph forms to highlight different aspects of data
- express probability in numerical notations
- use data to describe the probability of events in daily life.

The aims of MYP mathematics are to encourage and enable students to:

- enjoy mathematics, develop curiosity and begin to appreciate its elegance and power
- develop an understanding of the principles and nature of mathematics
- communicate clearly and confidently in a variety of contexts
- develop logical, critical and creative thinking
- develop confidence, perseverance, and independence in mathematical thinking and problem-solving
- develop powers of generalization and abstraction
- apply and transfer skills to a wide range of real-life situations, other areas of knowledge and future developments
- appreciate how developments in technology and mathematics have influenced each other
- appreciate the moral, social and ethical implications arising from the work of mathematicians and the applications of mathematics
- appreciate the international dimension in mathematics through an awareness of the universality of mathematics and its multicultural and historical perspectives
- appreciate the contribution of mathematics to other areas of knowledge
- develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics
- develop the ability to reflect critically upon their own work and the work of others.

The framework for MYP mathematics outlines four branches of mathematical study - numerical and abstract reasoning, thinking with models, spatial reasoning, and reasoning with data.

- **Numerical and abstract reasoning**
  - number sense and operations
  - commutativity, associativity and distribution of operations
  - estimation and approximation
  - measurement and units
  - decimal places and significant figures
  - equivalence in number and representation
  - proportional reasoning using ratios and percentages
  - how proportional relationships lead to linear equations and modelling
  - how ratios associate quantities that vary together
  - solving versus satisfying an equation
  - equivalent expressions
  - application and limitations of accuracy
  - money and financial literacy
  - appreciation of errors

- **Thinking with models**
  - representation and shape of functions
  - algorithmic thinking
  - transformations of functions
  - modelling with functions
  - applications and limitations of models

- **Spatial reasoning**
  - construction and manual skills
  - visualisation and representation of 3D shapes
  - moving between dimensions
  - algorithmic thinking in trigonometry

- **Reasoning with data**
  - variability and randomness
  - causation versus correlation
  - inferences and informal inferential reasoning
  - prediction and hypothesis testing
  - sampling, resampling and aggregation
  - the role of context in statistical inquiry
  - the connection between purpose and utility
  - outliers and how to separate the signal from the noise
  - critical literacy in statistics, considering sources and evaluating techniques
  - data distribution and how they can be analysed or compared
  - the law of large numbers
  - theoretical and experimental probabilities
  - listing strategies

	Numerical and abstract reasoning			
	MYP 2 and 3	MYP 4 and 5 (Standard)	MYP 4 and 5 (Extended)	Enrichment
Number	• Number operations • Forms of numbers (integers, fractions, decimals and percentages) and transforming between them • Estimation, including using appropriate forms of rounding to estimate results, decimal approximations and significant figures • Recurring decimals • Number lines and simple inequalities • Factors of numbers • Prime numbers and factors, including greatest common factor and least common multiple • Squares and square roots • Exponents • Ratios	• Number systems and notation (set of positive integers and zero (N), integers (Z), rational numbers (Q), irrational numbers (Q'), and real numbers (R)) • Absolute values • Representing inequalities, including compound and double inequalities • Number sequences (prediction, description) • Surds, roots and radicals including simplifying • Laws of exponents including integer and negative exponents • Standard form (scientific notation) • Direct and inverse proportion	• Lower and upper bounds • Logarithms, including laws of logarithms and the use of technology to find values • Laws of exponents, including fractional/rational exponents	• Rationalizing the denominator • Number bases
Algebra	• Find and verify rules for sequences • Forming equations • Operating with algebraic expressions • Substitution into expressions • Expanding brackets • Factorizing algebraic expressions • Rearranging and solving simple equations • Using formulae	• Find, justify and prove general rules/formulae for sequences • Solving simultaneous equations, including algebraically and graphically. (See also "Thinking with models") • Solving inequalities, including compound and double inequalities • Factorizing quadratic expressions • Solving quadratic equations using factorization, the quadratic formula and graphically • Rearranging formulae • Flowcharts and simple algorithms	• Using notation and formulae for arithmetic and geometric sequences to continue a sequence, find specific terms and the progression	• Exponential equations • Use notation and formulae to find the summation of an arithmetic sequence and a geometric sequence • Sigma notation • Convergence and divergence

Thinking with Models

	MYP 4 and 5 (Standard)	MYP 4 and 5 (Extended)	Enrichment
Thinking with models	• Mapping • Function notation • Linear functions of the form $f(x) = mx + c$ (see also "Spatial reasoning") • Parallel and perpendicular lines (see also "Spatial reasoning") • Systems of equations/simultaneous equations including solving algebraically and graphically (see also 'Numerical and abstract reasoning") • Quadratic functions in the form: ○ $f(x) = ax^2 + bx + c$ ○ $f(x) = a(x - p)(x - q)$ ○ $f(x) = a(x - h)^2 + k$ including the significance of their parameters • Representation and shape of exponential functions and their horizontal asymptotes • Algorithms (analyzing and using well-defined procedures for solving complex problems)	• Domain and Range • Rational functions of the for $f(x) = \frac{ax+b}{cx+d}$ • Linear programming, including inequalities • Transformation of quadratic functions, including translation, reflection and dilation • Representation and shape of cubic, rational, trigonometric and logarithmic functions and their asymptotes • Networks, including edges and arcs, nodes/vertices, paths • Calculating network pathways • Weighted networks	• Transforming cubic, and trigonometric functions • Functions including ln and e • Composite functions • Inverse functions • Logarithmic functions

Spatial reasoning

	MYP 2 and 3	MYP 4 and 5 (Standard)	MYP 4 and 5 (Extended)	Enrichment
Geometry	• Classifying shapes and angles • Calculations with angle properties • Angles in intersecting and parallel lines • Perimeter (circumference) and area of plane figures including triangles, circles, parallelograms, rhombuses, rectangles, squares, kites, trapezoids and compound shapes • Volume, surface area and nets of cubes, cuboids, cylinders and prisms • Coordinates • Symmetry and reflection	• Metric conversions • Circle geometry and theorems, including angles, radius, diameter and tangent • Length of arc and chord, perimeter and area of sector and segment • Volume, surface area and nets of pyramids, cones and compound three-dimensional shapes • $y = mx + c$, gradients and intercepts (see also "Thinking with models") • Gradients of parallel lines • Coordinate geometry, including distance, midpoint and gradient formulae • Rotation around a given point • Similarity and congruence, including proving similar and congruent triangles • Movement on a plane—isometric transformations, enlargements and tessellations	• Capacity • Relationship between gradients of perpendicular lines • Enlargement around a given point • Enlargement by a rational factor • Identical representation of transformations	• Fractals (informal introduction) • Dilation • Inscribing and circumscribing shapes • Arc length and sector using radians • Polar coordinates • Vector notation • Vector spaces

	Spatial reasoning			
	MYP 2 and 3	MYP 4 and 5 (Standard)	MYP 4 and 5 (Extended)	Enrichment
Trigonometry		• Triangle properties • Bearings • Pythagoras' theorem • Trigonometric ratios in right-angled triangles	• Converse of Pythagoras' theorem • Sine rule and cosine rule, including applications (link to trigonometric functions)	• Three-dimensional coordinate geometry • Area of a triangle rule • Unit circle • Radians • Equation of a circle with centre at the origin • Trigonometric identities

	Reasoning with data			
	MYP 2 and 3	MYP 4 and 5 (Standard)	MYP 4 and 5 (Extended)	Enrichment
Reasoning with data	• Simple discrete data and classifications • Data collection and generation, including surveys • Limitations and context in statistical enquiry (reliability of data, bias in sampling and estimation in calculations) • Graphical representations, including pie, bar charts, stem and leaf plots, pictograms • Data visualizations and infographics • Data processing, including mean, median (measure of central tendency) and mode, for discrete and grouped data • Measures of dispersion, including range • Qualitative handling of probability • Probability of simple events • Sample spaces • Probability scale, including significance of number • Theoretical probability and experimental probability	• Sampling techniques and response rates • Data manipulation and misinterpretation • Graphical representations, including bivariate graphs/scatter graphs, box-and-whisker plots, cumulative frequency graphs • Lines of best fit • Data processing, including mean, median (measure of central tendency) and mode, for continuous data, and quartiles and percentiles for discrete and continuous data • Measures of dispersion, including interquartile range (including application and relationship with the median) • Describing correlation, including positive, negative, none, strong and weak • Sets, including notation and operations up to three sets • Probability calculations with Venn Diagrams, tree diagrams and sample space • Mutually exclusive events • Combined events • Relative frequency	• Histograms for continuous fixed interval groups • Measure of dispersion, including standard deviation (including application and relationship with the mean) • Use of technology to find the numerical value for correlation and its meaning • Probability calculations for dependent and independent events (using the addition and multiplication rules) including conditional probability	• Manual calculation of standard deviation and correlation coefficient • Histograms and frequency polygons • Covariance • Interpolation and extrapolation • Confirmation bias • Counting principles • Combinatorics • Permutations • Factorials • Geometric mean • Regression—interpretation of results • Networks and probability, Pascal's triangle

NOTES:

From a personal point of view, I strongly think that a proactive and true progressive developmental approach is necessary for this document to exist and continue its natural evolving course. For this to happen, ALL teachers MUST adapt their curriculum content and think about its delivery while making connections with other subjects so as to achieve a holistic delivery while fostering skills.

The KUD Articulation for section Understanding will benefit from the following key descriptors, this may vary with each subject: Form an opinion, Question, Use, Get, Get into, Assimilate, Comprehend, Follow, Figure out, Incorporate, Perceive, Analyze, Evaluate, Choose, Register, Make sense, Infer, Deduce, Discern, Infer, Interpret, Master, Realize, Recognize, Able to i.e. *Incorporate* modelling techniques to illustrate fractions as part of a whole then transition to numerical representations.

The KUD Articulation for section Applying will benefit from the following key descriptors, this may vary with each subject: Practice, Affect, Involve, Concern, Describe, Employ, Connect, Master, Link, Integrate, Exercise, Put in application, Determine, Apply, Analyze, Recognize, Quantify, Claim, Appertain, Relate, Carry out, Put into, Develop use i.e. *Master* the correct calculation for fractions, percentages, decimals, and ratios.

Mathematics KUD Articulation

Grade 7 (MYP 2)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
At the end of the unit students will know the following content... • Integers • Absolute values • The coordinate grid • Multiplication and division • Addition and subtraction • Multiple operations • Fraction operations • calculate fraction of an amount, • order fractions, • Fraction, percentage, decimal, and ratio conversion • Order of operation • Data collection	**At the end of the unit, students will...** • *Incorporate* modelling techniques to illustrate fractions as part of a whole then transition to numerical representations • *Follow* order of operation skills to solve problems • *Make sense* on how to conduct research for data analysis and presentation • *Comprehend* the world of integers, how it is developed, and classified • *Follow* concepts of ratios to fractions depending on their mathematical usage • *Use* and connect with the coordinate grid to quantify data • *Register* the times table • *Get into* calculation of percentage of an amount (using two methods) • *Interpret* an amount as a percentage from another amount. • *Figure out* the transformation of ratios into fractions	**At the end of the unit students will be able to....** • *Master* the correct calculation for fractions, percentages, decimals, and ratios and their expression into another amount • *Put into* use transformation of of ratios into fractions • *Develop* an accurate understanding of ratios and proportions contrasted with fractions • *Put in application* that a missing variable can become the subject of an equations • *Quantify* data through collection of evidence represented in fractions and percentages • *Apply* calculation of fractions and percentages of information to everyday situation • *Analyse* sets of data representations • *Recognize* and apply integers within a unique context
At the end of the unit students will know the following content... • Review of Fractions, Decimals & Percentages • A hypothesis • Types of data • Data collection methods • Record Data types • Represent Data Types • Analyse Data information • Percentage and fraction to analyse information • Conclusions and evaluation of hypothesis/ main questions. • Stem-and-leaf plots • Measures of central tendency (mean, median, mode, range) • The effect of outliers • Measures of dispersion (range and quartiles) • Box and whisker plots	**At the end of the unit students will…** • *Create* a Hypothesis / main question and sub questions to direct research • *Identify* types of data and when to use them (primary, secondary, discrete, continuous, qualitative and quantitative) • *Select* the best data collection method (Survey, interview, questionnaire) • *Organise* data in table format (two-way table, tally table, frequency table) • *Select* appropriate methods to represent data in graphic form (pie chart, bar chart, line graph) • *Draw conclusions* by evaluating evidence that support their key question.(using percentages and fractions)	**At the end of the unit students will be able to....** • *Apply* appropriate methods and techniques to analyse information and predict trends and patterns • *Carry out* a plan to create a digital App campaign / platform that targets teenagers • *Employ* data in the form of an infographic to represent research • *Quantify*, calculate, represent, and data to draw conclusions supported by the gathered Mathematical evidence
At the end of the unit students will know the following content... • The brief historical timeline of algebra and its impact on modern mathematics • Mathematical vocabulary vs mathematical symbology • Sequences and patterns • Algebraic expressions and application (Shapes) • Algebraic values translated into simple formulae • Algebraic like terms and applications • Algebraic inequalities • Function machines • Polynomials • Difference between expression and	**At the end of the unit students will…** • *Make sense* of how algebraic expressions represent written words • *Recognize and Describe* describe pattern sequences • *Solve and explain* input and output of Function Machine • *Create* new sequences • *Verify* the links between Fibonacci Sequence and the Golden Ratio • *Solve* equations and expressions while applying Bodmas and following sign rules • *Solve* different types of equations • *Classify* algebraic expressions • *Simplify* expressions • *Write* expressions and equations	**At the end of the unit students will be able to....** • *Describe* sequences using algebraic expressions • *Apply* maths and explain how patterns are represented in nature • *Use* function machines to solve basic equations • *Apply* the four basic Mathematical terms for solving an equations / expression, (solve, simplify, factorize, reduce) • *Comprend* the importance that Algebra brings to critical thinking skills and to Mathematics and its various applications to real-life problems

Grade 7 (MYP 2)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
equation • Single bracket expansion • Double bracket expansion	• *Represent and solve* inequalities	
At the end of the unit students will know the following content... • Events and outcomes • Representation of probability through fractions, percentages, and ratios • Probability calculation and prediction • Theoretical versus experimental probability • Simulations • Properties of quadrilaterals and triangle and circle • Properties of lines • Properties of angles • Perimeter, Area, Volume of regular polygons • Volume of prisms • Measurements: conversion • Calculation of Forces and how to derive algebraically those formulas • Geometry of the circle (Extended)	**At the end of the unit students will...** • *Understand* events while defining and representing probability • *Calculate* probability • *Contrast* theoretical vs experimental probability • *Conduct* simulations • *Make sense* of shape properties including similar and congruence • *Identify* and draw types of lines (Ray, segments, line, parallel, diagonal, perpendicular, intersection lines) • *Identify*, measure - using protractors and constructing angles using compass. • *Identify* and calculate parallel angles • *Understand* how to use formulae to calculate area and perimeter including compound shapes, circles and (Extended surface area and using algebra) • *Calculate* volume of prisms including cone and cylinder (Extended pyramid including rearranging formulae) • *Make sense* of unit conversion and metric unit • *Understand* forces and derive algebraic formulas • *Understand* volumes and areas of shapes • *Recognize* that geometric formulae and be expressed algebraically	**At the end of the unit students will be able to....** • *Evaluate* events and predict outcomes • *Evaluate* the outcome of a probability • *Create* simulations based on theoretical and experimental probability • *Evaluate* the special properties of a triangle, through construction of bridges • *Construct* a right angles triangle using a protractor and compass. • *Consider* the properties of 2D and 3D shape • *Calculate* volume, area, and perimeter of shapes through making the variable the subject of the equation • *Interpret* forces, their attributes, and their usage • *Calculate* forces and derive algebraic formulas

Grade 8 (MYP 3)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
At the end of the unit students will know the following content... • Introducing number • Rational and irrational numbers • Exponents • Scientific notation • Polynomials • Sequences • Solving equations • Substitution • Bracket Expansion • Factorisation • Linear relationships • Algebraic representations of linear relationships • Linear systems & linear equations	**At the end of the unit students will understand the following content...** • *Figure out* the difference between rational and irrational numbers • *Make sense* of exponents and scientific notation • *Make sense* of polynomials • *Interpret* and develop sequences • *Interpret* and develop the Fibonacci sequence in various formats • *Understand* how to solve equations by substitution • *Expand* brackets • *Factorise* the expanded bracket • *Solve* linear systems & linear equations • *Problem solve* linear equations	**At the end of the unit students will be able to....** • *Apply* knowledge of rational and irrational numbers when solving a problem • *Apply* exponents and scientific notation when solving a problem • *Classify* polynomials • *Apply* mathematical sequences • *Apply* the Fibonacci sequence to the Golden Ratio • *Apply* the correct methods when solving an equation by substitution • *Put in application* expansion of brackets • *Recognize* that the factorization of brackets brings back an expansion to its original format • *Apply* linear systems & linear equations to real-life situations

<table>
<tr><th colspan="3">Grade 8 (MYP 3)</th></tr>
<tr><th>Know

What other essential knowledge information is needed for this unit?</th><th>Understand

What other understanding will students gain from learning the knowledge information of this unit?</th><th>Do

What skills do students further need to develop in deepening the learning of the knowledge information and their understanding?</th></tr>
<tr><td>At the end of the unit students will know the following content...
The world of 3D shapes
Cylinders
Cones
Pyramids
Spheres
Geometric transformations
Tessellations
Congruence transformations
Similarity transformations</td><td>At the end of the unit students will...
<u>How</u> to identify and describe the properties of 3D shapes
<u>How</u> to calculate surface area and volume, and apply these to real-life situations
<u>Visualize and interpret</u> 3D shapes from 2D representations
<u>How</u> shapes change (or stay the same) under translations, rotations, reflections, and dilations
<u>Make sense</u> of the concept of congruence and similarity, which forms the basis for understanding patterns, symmetry, and structure
<u>How</u> transformations are used in animation, graphic design, mapping, and robotics
<u>Understand</u> how shapes tile a surface without gaps or overlaps, reinforcing ideas of pattern, symmetry, and repetition
<u>Make sense</u> of the mathematical beauty and order in nature, art, and architecture (e.g., Islamic tiling, M.C. Escher's work)
<u>How</u> tessellations relate to geometry, creativity, and spatial awareness</td><td>At the end of the unit students will be able to....
<u>Identify and describe</u> the properties of 3D shapes including cylinders, cones, pyramids, and spheres
<u>Calculate</u> surface area and volume of these 3D shapes using appropriate formulas
<u>Apply</u> geometric reasoning to solve real-life problems involving 3D shapes (e.g., storage, architecture, and design)
<u>Perform and describe</u> transformations on 2D shapes, including translations, reflections, rotations, and dilations
<u>Explore</u> congruence and similarity through transformations, identifying conditions under which shapes are congruent
<u>Create and analyze</u> tessellations, using geometric rules and transformations to recognize patterns and symmetry
<u>Reflect</u> on the real-world relevance of geometric transformations in fields such as art, design, architecture, and nature</td></tr>
<tr><td>At the end of the unit students will know the following content...
Introducing bivariate data
Representing bivariate data
Analyzing bivariate data
Correlation and causation</td><td>At the end of the unit students will...
<u>Understand</u> that there is a relationship between variables
<u>Understand</u> that the interaction of two variables can reveal meaningful patterns
<u>Recognize</u> the difference between dependent and independent variables
<u>Understand</u> data representation and interpretation
<u>Represent</u> bivariate data using scatter plots
<u>Visualize</u> trends that identify patterns, and assess the strength and direction of relationships
<u>Develop skills</u> to interpret data trends using tools such as lines of best fit,
<u>Make</u> predictions and draw conclusions from real-world data sets.
<u>Understanding</u> correlation and causation</td><td>At the end of the unit students will be able to....
<u>Define and identify</u> bivariate data
<u>Determine</u> independent and dependent variables in a real-world data situation
<u>Collect</u>, organize, and represent bivariate data using scatter plots and appropriate graphing tools
<u>Interpret</u> patterns and trends in scatter plots
<u>Draw and analyze</u> lines of best fit, using them to make predictions and estimate values
<u>Differentiate</u> between correlation and causation
<u>Use</u> mathematical reasoning to evaluate data-based claims, identifying possible sources of bias or misinterpretation.
<u>Communicate</u> findings clearly, using appropriate terminology, representations, and written explanations
<u>Apply</u> data analysis to real-life problems
<u>Reflect</u> on how analyzing relationships between variables can inform decision-making in scientific, social, or personal contexts
<u>Draw conclusions</u> through Analysis</td></tr>
<tr><td>At the end of the unit students will know the following content...
Triangles and their properties
Properties of a right-angle triangle
Theorems are related to triangles (Pythagoras & Heron's)
The relationships between triangles and their angles
Trigonometric ratios
Soh Cah Toa
3D Pythagoras Theorem
Real-life application of trigonometry (Soh</td><td>At the end of the unit students will understand the following content...
<u>How</u> to work and rearrange the formula for Pythagoras Theorem to calculate the missing sides of a right-angle triangle
<u>How</u> to identify the sides of a triangle with one angle in place
When to use Pythagoras Theorem vs Soh Cah Toa
<u>How</u> to calculate the missing angle of a triangle (Inverse function)
<u>How</u> to calculate the volume of a pyramid</td><td>At the end of the unit students will be able to....
<u>Have</u> a deeper understanding of how right angled triangles can be used to solve many familiar and unfamiliar problems
<u>Utilize</u> trigonometry and Pythagoras theorem to interpret and solve real-life situations problems
<u>Determine</u> the validity of a theorem and its applications
<u>Develop</u> awareness of volume in an abstract context</td></tr>
</table>

<table>
<tr><th colspan="3">Grade 8 (MYP 3)</th></tr>
<tr><th>Know

What other essential knowledge information is needed for this unit?</th><th>Understand

What other understanding will students gain from learning the knowledge information of this unit?</th><th>Do

What skills do students further need to develop in deepening the learning of the knowledge information and their understanding?</th></tr>
<tr><td>Cah Toa)
• Volume of pyramid
• Volume of frustum
• Surface area of pyramid</td><td>and Frustum
• <u>How</u> to calculate the surface area of a pyramid
• <u>How</u> trigonometric ratios are applied in real life situations</td><td>• <u>Recognize</u> that theorems have proof and validity</td></tr>
</table>

<table>
<tr><th colspan="3">Grade 9 (MYP 4)</th></tr>
<tr><th>Know

What other essential knowledge information is needed for this unit?</th><th>Understand

What other understanding will students gain from learning the knowledge information of this unit?</th><th>Do

What skills do students further need to develop in deepening the learning of the knowledge information and their understanding?</th></tr>
<tr><td>At the end of this unit, students will know the following content…
• Classification of different kinds of real numbers
• Representation of the different kinds of real numbers
• Venn Diagrams
• Language of sets to different areas of mathematics
• Language sets to model real-life applications

Look into “probability” to complete this unit if possible…</td><td>At the end of the unit students will...
• <u>Be able to</u> classify and represent different kinds of real numbers
• <u>Draw and interpret</u> Venn Diagrams to solve problems in real-life contexts
• <u>Develop</u> the language of sets to different areas of mathematics
• <u>Use</u> the language of sets to model real-life problems</td><td>At the end of the unit students will be able to....
• <u>Classify</u> real numbers into natural, whole, integers, rational, and irrational categories
• <u>Represent</u> different types of real numbers using number lines, diagrams, and symbolic notation
• <u>Incorporate</u> Venn diagrams to organize and compare sets, identifying intersections, unions, and complements
• <u>Apply</u> the language of sets to describe, analyze, and solve mathematical problems across topics like number systems, algebra, and statistics
• <u>Model</u> real-life problems using set language and diagrams to show groupings and logical relationships</td></tr>
<tr><td>At the end of this unit, students will know the following content…
• Desmos Graphing Calculator
• Relationship & function
• The mapping of diagrams
• Ordered pairs in a relation
• Domain & Range
• Functions using correct notation
• y=mx+c, gradients and intercepts (see also "Thinking with models")
• Gradients of parallel lines
• Coordinate geometry, including distance, midpoint and gradient formulae
• Linear equations
• Equation of a line
• Graph plotting</td><td>At the end of the unit students will...
• <u>Discover</u> the various functionalities of Desmos Graphing Calculator
• <u>Develop</u> an understanding and usage of relationship and function
• <u>Interpret</u> how a function works
• <u>Discover</u> the domain and range found on a graph
• <u>Implement</u> a function notation on a graph
• <u>Understand</u> the difference of linear equation and equation of a line
• <u>Make sense</u> of how are different forms of linear equations represented in a graph
• <u>Understand</u> the difference between a relation and a function
• <u>Understand</u> mapping diagrams
• <u>Know</u> how to find ordered pairs in a relation
• <u>Understand</u> domain & range
• <u>Manipulate</u> functions using the correct notation</td><td>At the end of the unit students will be able to....
• <u>Recognize</u> how relations and functions interact in a Cartesian plane
• <u>Master</u> the usage of Desmos Graphing Calculator to plot numbers and functions
• <u>Graph</u> linear equations and determine their connection to triangles in a designated space
• Apply the different forms of linear equations on paper and on the Desmos Graphing Calculator
• <u>Define and describe</u> relations and functions, distinguishing between them in context
• <u>Create and interpret</u> mapping diagrams to visualize how elements of a domain are related to elements of a range
• <u>Plot and interpret</u> ordered pairs on the Cartesian plane to represent real-world relationships
• <u>Determine</u> the domain and range of a relation or function in context
• <u>Incorporate</u> proper function notation to write and evaluate functions in symbolic form</td></tr>
<tr><td>At the end of the unit students will know the following content...</td><td>At the end of the unit students will...
• <u>Comprehend</u> complex geometrical</td><td>At the end of the unit students will be able to....</td></tr>
</table>

Grade 9 (MYP 4)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• Complex Geometry • Theorems and axioms • Area, perimeter, surface area and Volume of prisms (cuboids, circle, cylinder, cone, pyramid) • Surface area of 3D shape • volume of 3D shape • Angels and properties of Polygons • SOHCAHTOA /Trigonometric ratios (extended - sine and cosine rule) • Complex diagrams and real-life problems for SOHCAHTOA • Pythagoras Theorem (including 3D problems - Extended) • Angles of elevation and angles of depression • Desmos Art • Fusion 360	concepts • *Form an opinion* regarding the importance of theorems and axioms • *Know how* to calculate surface area and volume of prisms and 3D shapes • *Determine* the properties of Polygons • *Manipulate* trigonometric ratios and rearrange formulae and substitute values into expressions • *Understand* how to calculate trigonometric ratios • *Understand* trigonometric information applied to a real-life scenario • *Understand* sine and cosine rule • *How* to animate lines and objects on Desmos Graphing Calculator • *Create* geometric objects on Desmos Graphing Calculator • *Understand* how Fusion 360 functions to create complex shapes	• *Apply* complex geometry • Put in application theorems and axioms • *Apply* calculations of 3D shapes and their properties • *Apply* SOHCAHTOA and Pythagoras Theorem to solving many real-life constructions • *Apply* skills and knowledge in unfamiliar situations when using trigonometric ratios • Apply sine cosine rule in real-life scenarios • *Appertain* the importance of creation imagination, critical thinking and the interconnectedness between Mathematics, Art, and Design • *Apply* all the mathematical knowledge of the unit to create unique designs in Desmos and Fusion 360
At the end of the unit students will know the following content... • Bracket expansions • 7 method expansion • Factorisation LCM • Functions • Quadratic Equations/Factorisation • Simultaneous Equations • Equations by elimination with 2 and 3 variables • Introduction to Physics • Motion • Projectile motion	**At the end of the unit students will...** • *Understand* how to solve simultaneous Equations using (substitution, elimination methods and graphic methods • *Understand* how to develop the distributive property to expand algebraic expressions, including binomials and trinomials • *Deepen* their understanding of how multiplication applies to expressions • *Infer* how expansions help transform expressions • *Grasp* how factorisation is the reverse of expansion for simplifying expressions and solving equations • *Understand* the role of common factors, highest common factors (HCF), and lowest common multiples (LCM) • *Break down* complex algebraic expressions into manageable parts, essential for solving quadratic equations • *Understand* the concept of a function as a special type of relation where each input has exactly one output • *Explore how* to represent functions using mappings, tables, graphs, and algebraic rules • *Understand* how to solve quadratic equations using factorisation, completing the square, and the quadratic formula • *Grasp* how parabolic graphs represent quadratic functions and how the roots relate to factorised form • *Grasp* how simultaneous equations are used in real-life situations • *Understand* how elimination simplifies complex systems • *Understand* how working with 3-variable systems develops logical strategies and persistence, enhancing critical thinking • *Make sense* of mechanics and kinematics • *Understand* the basic principles of motion for projectile motion • *Explore how* rockets can fly via simulators	**At the end of the unit students will be able to....** • *Develop* a deeper understanding of algebraic principles • *Transfer* skills to other subjects • *Expand* algebraic expressions using distributive and structured methods • *Factorise* algebraic expressions and quadratics using common factors, grouping, or trinomial techniques • *Apply* knowledge of LCM and HCF in simplifying expressions and solving word problems • *Understand*, represent, and evaluate functions using notation, mapping diagrams, and graphs • *Apply* methods to solve quadratic equations by factorisation and relate solutions to their graphical representations • *Apply* methods to solve simultaneous linear equations in two and three variables using elimination and substitution • *Model and solve* real-life problems using algebraic equations, expressions, and systems • *Apply* algebraic solutions and justify methods clearly using appropriate language and symbols • *Apply* projectile motion equations to a moving projectile on “x” and “y”-axis

Grade 10 (MYP 5)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
At the end of this unit, students will know the following content... • Pólya's problem solving methodology • Select and applying appropriate mathematical strategies to solve problems • Checking if a solution makes sense in the context of the problem • Formula construction • Substituting into formulae • Rearranging formulae • Rearrangement and substitution • Predicting formulae	**At the end of the unit students will...** • *Understand* that problem-solving is a structured process involving understanding the problem, devising a plan, carrying it out, and reflecting on the solution • *Deduce* that problem-solving can be seen as a cycle rather than a linear process, with emphasis on reasoning, trying different approaches, and learning from unsuccessful attempts • *Develop* perseverance and logical thinking through applying strategy • *Understand* that solving mathematical problems often requires choosing the most suitable strategy • *Develop* the ability to justify choice of method and evaluate its effectiveness • *Realize* that problem-solving is creative and flexible, rather than rigid or formulaic • *Learn* the importance of verifying solutions by interpreting results in the context of a real-world or mathematical scenario • *Understand* how reasonableness, estimation, and back-substitution can confirm or question answers • *Understand* that mathematical methodologies help build self-correction habits and mathematical intuition • *Understand* how to construct a formula from a given situation or relationship • *Understand* how to substitute values correctly into a formula to calculate a desired quantity • *Perceive* mathematics as a tool for modelling real-life scenarios. • *Recognize* patterns and relationships between variables and learn to manipulate expressions algebraically to predict or construct new formulae • *Build* algebraic fluency applicable to other subjects	**At the end of the unit students will be able to....** • *Justify* the usage of formulae, problem solving and applying it to the world to other subjects • *Apply Pólya's* four-step problem-solving method to various types of mathematical challenges • *Select* appropriate strategies to solve mathematical problems based on context • *Evaluate* the reasonableness of a solution by checking for accuracy and interpreting results in context • *Construct and apply* formulae to represent relationships in real-life or mathematical scenarios • *Substitute* values into formulae correctly to calculate outcomes • Rearrange formulae to isolate a variable and solve for unknowns efficiently • *Use and apply* substitution and rearrangement together to solve complex or layered problems. • *Predict or create* new formulas from observed patterns in data, tables, or word problems • *Apply* mathematical concepts and their methodologies to reinforce mathematical intuition
At the end of the unit students will know the following content... • Algebra enrichment • The change in the subject of a formula • Rational algebraic expressions simplified • Mathematical Operations on rational algebraic expressions • Constant of proportionality • Direct and indirect proportions equations • Direct and indirect graph relationships • Direct and inverse proportion from graphs • Direct and Inverse proportion from tables of values	**At the end of the unit students will...** • *Understand* the importance of rearranging formulas • *Simply and formulate* a rational expression • *Develop* fluency in factoring, finding common denominators, and recognizing restrictions on the domain • *Grasp* how rational expressions behave similarly to numerical fractions and how they can model real-world constraints • *Understand* that the constant of proportionality (k) defines the fixed multiplicative relationship between two directly proportional quantities • *Learn* how to find or use this constant in equations and graphs (e.g., $y = kx$ and y = k/x) and relate it to rates such as speed or cost per unit • *Understand* how direct and inverse proportions are represented visually on graphs • *Learn* how direct proportions form straight	**At the end of the unit students will be able to....** • *Perform* operations (addition, subtraction, multiplication, division) on rational algebraic expressions with fluency and accuracy • *Identify* restrictions in the domain based on values that make the denominator zero • *Simplify* complex rational expressions using factorization and common denominators. • *Define* and determine the constant of proportionality in equations and real-world situations • *Formulate and solve* equations representing direct and inverse proportional relationships. • *Interpret* proportional relationships algebraically and represent them graphically using: y=kx (direct) $y=k/x$ (inverse)

Grade 10 (MYP 5)		
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	lines through the origin. • *Develop* Inverse proportions form hyperbolic curves • *Analyze and compare* graphs to make predictions and draw conclusions • *Understand* how to identify whether a relationship is direct or inverse by examining patterns in a table of values • Verify proportional relationships and determine constants from tabulated data, reinforcing connections between algebra and number patterns	• *Analyze and interpret* graphs of direct and inverse proportion; describe the nature of the relationship using slope, curvature, and intercepts • *Examine* tables of values to determine the type of proportionality, calculate the constant of proportionality, and justify conclusions • *Apply* knowledge of rational expressions and proportions to solve real-life problems involving speed, rates, cost, density, work, and variation • *Critically* reflect on the validity of proportional models and recognize their limitations in certain contexts
At the end of the unit students will know the following content... • Problems in right angled triangles using trigonometric ratios • Properties of trigonometric ratios • Problems with angles of elevation and depression • Sine and Cosine rule • Sine and Cosine functions • Periodicity • Sine and Cosine functions using translations, reflections, and dilations • Transformations of sine and cosine graphs, and finding the equation of graphs • Real-life applications of sine and cosine functions	**At the end of the unit students will...** • *Understand* trigonometric ratios — sine, cosine, and tangent — represent relationships between side lengths in right-angled triangles • *Understand* that SOH-CAH-TOA helps to find missing angles and sides in geometric and real-life contexts • *Understand* how trigonometric ratios remain consistent for a given angle, regardless of the size of the triangle • *Grasp* that trigonometric functions are based on the unit circle and that ratios link angle measures to proportions • *Understand* how trigonometry applies to solving problems involving line-of-sight and real-world perspectives • *Use* diagrams to interpret and solve problems involving height, distance, and angle • Understand how the sine and cosine rules extend trigonometry beyond right-angled triangles • *Learn* when and why to apply each rule, depending on the known values in oblique triangles • *Understand* that sine and cosine are functions that can be graphed, and their values vary periodically with angle input • *Recognize* amplitude, period, and midline in trigonometric graphs, and how these relate to real-life patterns (e.g., tides, sound waves) • *Understand* that sine and cosine functions are periodic, meaning they repeat their values in regular intervals • *Explore* how periodic functions model cyclical phenomena such as seasons, circular motion, and alternating current in physics • *Understand* how transformations affect the graphs of sine and cosine functions. • *Understand* how to identify and describe changes in amplitude, frequency (period), vertical shifts, and phase shifts • *Understand* how to use these transformations to construct the equations of transformed graphs • *Understand* that sine and cosine functions are used to model various real-world scenarios involving cycles, waves, and rotational motion.	**At the end of the unit students will be able to....** • *Solve* problems involving right-angled triangles using trigonometric ratios (SOH-CAH-TOA) • *Interpret and apply* the properties of trigonometric ratios to find unknown sides or angles • *Analyze and solve* real-world problems involving angles of elevation and depression • *Apply* the **Sine Rule** and **Cosine Rule** to solve problems involving oblique triangles • *Describe* and graph sine and cosine functions, identifying key features such as amplitude, period, and midline • *Apply* periodicity and how it models repeating phenomena in real life. • *Perform and describe* transformations of sine and cosine graphs (translations, reflections, dilations) • *Construct and apply* the equation of a sine or cosine function given a graph or transformation scenario. • *Apply* trigonometric functions to model and solve real-life problems, including oscillations, circular motion, sound waves, and tidal patterns • *Evaluate* the appropriateness and limitations of trigonometric models in context.
At the end of the unit students will know the following content...	**At the end of the unit students will...**	**At the end of the unit students will be able to....**

Grade 10 (MYP 5)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• Systems of linear equations algebraically and graphically • Systems of equations by elimination • Equivalent transformations to solve linear equations and systems of equations • Exponential equations into Logarithms and vice versa • Exponential statements as a logarithmic statements • Solving exponential equations using logarithms • Writing and solving logarithmic equations from real-life situations • Using Natural logarithms • Developing the laws of logarithms • Using the laws of logarithms to simplify expressions and solve equations • Proving the laws of logarithms • Proving the change of base formula • Solving quadratic and rational inequalities both algebraically and graphically • Solving other non-linear inequalities graphically • Using mathematical models containing non-linear inequalities to solve real-life problems	• *Comprehend* a system of equations by elimination • *Follow* applications of systems of equations by elimination • *Choose* the most convenient method to solve a system of linear equations • *Evaluate* logarithms with an without calculator • *Master* exponential equations into logarithmic form and vice versa	• *Apply* systems of linear equations by elimination with four different methods • *Put in application* if the systems of linear equations intersect at the coordinates (x,y), are TRUE with Infinitely many solutions, or FALSE are there are No Solutions

NOTES:

MYP Grade 7 Unit 3 is an IDU with Design for Digital App Development
MYP Grade 7 Unit 4 is an IDU with Science / Physics for Bridge / Furniture Design (Scheduled)
MYP Grade 8 Unit 1 is an IDU with I & S / Ancient Civilization & Historical Mathematics “Fibonacci”
MYP Grade 8 Unit 2 is designed & developed in ample detail for an IDU with ART (Testing a different method)
MYP Grade 8 Unit 3 is a potential IDU with Science for Data analysis
MYP Grade 8 Unit 4 is a potential IDU with Art
MYP Grade 9 Unit 3 is a potential IDU with Art & Design / Desmos Art & Fusion 360 Design
MYP Grade 9 Unit 4 is an IDU with Science / Physics for Projectile Motion
MYP Grade 10 Unit 1 is designed & developed in ample detail for an IDU with Design for Creative solution / Problem solving