Ramallah Friends School

Mathematics department

Mathematics Vertical plan (Subject Overview)

MYP Years (1-5)

Year 1

Numbers							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Numbers	**Form**	**Quantity** **Representation**	**Scientific & Technical Innovation** **Math provides a global language in science and technology that supports human understanding of scientific principles.**	**Quantities are represented in different forms to help us understand changes in our natural environment.**	**A, B, D**	**Critical thinking skills** **Propose and evaluate a variety of solutions**	**Know:** number system **Understand:** how to use the order of operations, and apply the four basic operations in both positive and negative numbers. **Do:** find the square roots, the cubic roots, factors.

Geometry							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Geometry	**Form**	**Quantity** **Space**	**Personal and cultural expression** **the way in which we reflect on and enjoy our creativity/ our appreciation of the aesthetic.**	By using mathematical forms and our knowledge of quantity, we can create aesthetic spaces in art, architecture and other modes.	**A, B, C, D**	**Transfer skills** **Combine knowledge, understanding and skills to create products or solutions.** **Communication skills** **Understand and use mathematical notation**	**Know: what does space mean.** **Properties of different kinds of polygons.** **Angles of triangles and quadrilaterals.** **The connection between the circumference of a circle and the length of its diameter.** **Understand: how to find the depth of triangle, parallelogram and trapezium.** **What is so special about parallelograms?** **the difference between radius and diameter.** **Do: calculate the perimeters and areas of triangles, rectangles, squares, parallelograms, and trapezium.** **calculate the circumference and area of circles.** **calculate the area and perimeter of shaded areas, and composite figures.** **creativity aesthetic design for a garden.**

Algebra							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Introduction to Algebra	**Logic**	**Pattern** **Generalization**	**Scientific & Technical Innovation** Math provides a global language in science and technology that supports human understanding of scientific principles.	**A logical process is needed to see patterns in the natural world around us.**	**A, B**	**Critical thinking skills** **Draw reasonable conclusions and generalizations.** **Transfer skills** **Apply skills and knowledge in unfamiliar situations**	**Know:** difference between a variable and a constant. **Understand:** meaning of algebraic expression, equation. **Do:** add, subtract, and multiply algebraic expressions.

Rations and Percentage							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Ratios, Rates & Proportions	**Relationships**	**Equivalence** **Simplification**	**Globalization & Sustainability** Exploration: diversity and interconnection .	**Simplification can lead to an understanding of the equivalence within relationships**	**A, D**	**Creative thinking skills** **Create novel solutions to authentic problems.**	**Know:** properties of ratio and how to compare ratios, how to write a proportion. **Understand:** how to write a proportion, how to convert fractions to decimals and decimals to percentages. **Do:** use and analyze proportional relationships and percentages, and use them to solve real world and mathematical problems.

Statistics and Probability							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Statistics and probability	**Relationships**	**Representation**	**Globalization & sustainability** **We use statistics in everyday life relations representation.**	**The relations in data can be displayed and represented in a variety of ways.**	**A,C,D**	**Communication skills** **Understand and use mathematical notation** **Critical thinking skills** **Propose and evaluate a variety of solutions** **Self-management: Organization** **Use appropriate strategies for organizing complex information**	**Know:** the concept of statistics and probability, and how to read and understand a frequency table. **Understand:** how to represent data using columns & circular sectors. **Do:** measure the center and spread of different data.

Year 2

Number							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Integers and rational numbers	**Form**	**Representation,** **Quantity**	**Scientific and technical innovation** **Exploration: ingenuity and progress**	Representing quantities in equivalent forms may enhance ingenuity and progress	**A, B, C and D**	**Communication skills** **Understand and use mathematical notation** **Transfer skills** **Apply skills and knowledge in unfamiliar situations** **Critical thinking skills: Propose and evaluate a variety of solutions**	**Know:** absolute value, integers and their properties, opposite of a number, mixed numbers, order of operations, representing integers and rational numbers on the number line. **Understand:** Numbers and mathematical operations on integers and their properties (commutative, associative, closure, inverse, and identity **Do** apply operations in real life context through which simplification of rational numbers and numerical expressions are used to solve the problems.

Ratios and Proportions							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Ratios and proportions	**Logic**	**Quantity** **Simplification**	Globalization and sustainability Exploration: diversity and interconnection	**Looking at simplified quantities in a logical manner helps us make decisions that impact our diverse and interconnected communities**	**A, B, D**	**Critical thinking skills:** **Propose and evaluate a variety of solutions** **Communication skills** Understand and use mathematical notation Organize and depict information logically	**Know:** ratio, proportion. **Understand:** the difference between direct and inverse proportions **Do:** solve problems using ratios and proportions.

Sets							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Sets and Venn Diagrams **(15 hours)**	**Relationships**	**Equivalence** **Pattern**	**Scientific & Technical Innovations** - Adaptation, ingenuity and progress	**Sets provide a useful way of representing relationships and patterns between different groups.**	**A, B, C and D**	**Self-management: Organization** **Use appropriate strategies for organizing complex information** **Communication skills** Understand and use mathematical notation Organize and depict information logically	**Know**: Set Notation and sets of members, different ways to represent sets, the Universal Set and subsets **Understand**: the representation of operations on sets using Venn diagrams. **Do**: Use Venn diagrams to model and solve problems from real life situations.

Algebra							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Algebraic Expressions and equations	**Logic**	**Representation** **System**	**Scientific & Technical Innovations** - Systems, models, methods; products, processes and solutions	Algebra follows a logical system of reasoning using variables to represent the unknown, supporting science and finding solutions.	**A, B, D**	**Transfer skills** Apply skills and knowledge in unfamiliar situations. **Self-management Organization** **Use appropriate strategies for organizing complex information**	**Know:** variable, Constant, like and different terms, simplifying and expanding. **Understand**: Algebra as a set of rules; like only like terms can be added or subtracted **Do**: Simplify like terms, apply the distributive property and factor expressions

Geometry							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Geometry	**Form**	**Space** **Quantity**	Globalization and sustainability Exploration: natural resources, conservation	Conservation of natural resources can be enhanced by designing structures (forms) that consider quantity and space	**A,C,D**	**Creative thinking skills** **Create novel solutions to authentic problems.** **Communication skills** **Use appropriate forms of writing for different purposes and audiences**	Students should be able to: ● Understand units of measurement ● Convert units of measurement ● Read scales ● Measure length ● Calculate perimeter of shapes ● Calculate area of shapes ● Calculate area of composite shapes ● Find volume of 3D shapes ● Find capacity of objects.

Year 3

The set of real numbers							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Rational and irrational numbers	**Form**	**Representation**	**Orientation in time and space.** Exploration: processes and solutions	Quantities can be represented in different forms where solutions are influenced by time and place.	**A,B,D**	**Self-management: Organization** **Use appropriate strategies for organizing complex information** **Creative thinking skills** **Apply existing knowledge to generate new ideas, products or processes**	**Know**: difference between rational and irrational numbers. **Understand:** Surds and indices and operations on them **Do**: Solve problems containing operations on surds and indices from real life in both familiar and unfamiliar contexts.

Numbers and Algebra							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
The set of Real numbers	**Form**	**Change** **Generalization**	**Orientation in space and time** Exploration: exchange and interaction	Writing numbers in different forms helps us realize the importance of exchange and interaction	**A,B,C,D**	**Critical thinking skills** **Propose and evaluate a variety of solutions** **Self-management: Organization** **Use appropriate strategies for organizing complex information** **Communication skills** Understand and use mathematical notation Organize and depict information logically	**Know**: Real numbers represent positive and negative quantities. **Understand:** Real numbers and operations. **Do**: Solve problems applying the operations on real numbers and their properties.

Geometry							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Geometry of polygons	**Form**	Measurement Space	Globalization and Sustainability Human impact on the environment	Discovering properties of shapes can help in the design of new sustainable structures.	**A, B, D**	**Critical thinking skills** **Gather and organize relevant information to formulate an argument** **Creative thinking skills** **Practice observing carefully in order to recognize problems.**	**Know**: Theorems of Isosceles Triangles. Properties of the Equilateral Triangles. Interior and Exterior angles of triangles. Pythagoras Theorem, its converse and Pythagorean Triples. Similarity of triangles and other polygons, scale factor, area factor and perimeter factor Triangular Inequalities. **Understand**: Mid segments in triangles and trapezoids. Quadrilaterals and their properties. **Do**: Solve problems using the properties and theorems learned.

Numbers and Algebra							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Algebra **(30 hours)**	**Logic**	Representation	**Scientific and technical innovation.** Exploration: Processes and solutions	**By using a logical system of reasoning to represent quantities, we can improve our understanding of the natural world.**	**A, B, D**	Critical thinking skills **Propose and evaluate a variety of solutions.** Critical thinking skills **Draw reasonable conclusions and generalizations.**	**Know**: Algebraic notation, algebraic equations, like terms, Factorizing methods (GCF, difference of two squares, perfect square, and by grouping) **Understand**: the standard form of the quadratic equations and its factorization. The null factor law. **Do**: Solve quadratic equations by factorization, and problem solving when it contains quadratic equations.

Year 4

Relations and Functions							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Linear Functions **(35 hours)**	**Relationships**	Model Representation	**Globalization and sustainability** *(Exploration: Impact of decision making on humankind and environment)*	decision making can be improved by using a model to represent relationships.	The following MYP year 4 Mathematics objectives are identified: A i, ii, iii; C i. ii. iii, iv, v; D i, ii, iii, iv, v.	**Critical thinking skills: Propose and evaluate a variety of solutions.** **Transfer skills** **Apply skills and knowledge in unfamiliar situations** **Communication skills** Understand and use mathematical notation Organize and depict information logically	**Know**: Distance formula, Midpoints, Gradient and equation of a line. Dependent and independent variable. **Concept:** The relation between parallel lines and perpendicular lines in terms of gradient. The significance of gradient, in real life contexts. Simultaneous equations in real life. **Skills:** Use the graph of a line to determine the gradient, x-intercept and y- intercept. Solve Multi step problems containing gradient, midpoint and distance between two points (circle, parallelogram, triangles,...etc).Creating and solving simultaneous equations by elimination, substitution and graphing.

Relations and Functions							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Quadratic Functions	**Relationships**	Model change	**Identities and relationships** **Exploration:** lifestyle choices, health and wellbeing	Modelling can help us understand our relationships in order to make changes and create models that can affect our lifestyle choices and our health and well-being	**A, D** unit tests to measure the understanding and ability to apply math in real life applications.	**Critical thinking skills** **Propose and evaluate a variety of solutions** **Transfer skills** **Apply skills and knowledge in familiar and unfamiliar situations.** **Transfer skills** **Combine knowledge, understanding and skills to create products or solutions.**	**Knowledge**: y-intercept, x-intercept, parabola, vertex, zeros, roots, discriminant and shape of parabola. **Concepts**: Forms of equations, graphing parabolas. **Skills**: Solve quadratic equations algebraically and graphically. Applying quadratic functions in real life applications.

Number and Algebra							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Exponents and logarithms	**Relationships**	**Justification Models**	**Scientific and Technical innovations.** **Exploration:** Human impact on the environment (the increasing number of populations on Earth endangers the resources available).	Modeling exponential growth relations helps scientists to justify the enormous growth in the need of resources and to create innovative alternatives and solutions.	**A,C, D** **A, D: unit test.** **C:** project on modeling the population of Jordan; students will examine different types of functions so they conclude the model that best fits the data collected.	**Creative thinking skills** **Apply existing knowledge to generate new ideas, products or processes** **Communication skills** **Understand and use mathematical notation.** **Critical thinking skills** **Test generalizations and conclusions**	**Knowledge**: Exponents, Rules of exponents, negative numbers in exponents, radicals and exponents. logarithms and rules of logarithms. **Concept**: express radicals in exponential form, scientific notation. The relationship between exponents and logarithms. **Skills**: move from exponential form into logarithmic and vice versa. graph and determine the domain and range of logarithmic and exponential function.

Geometry							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Circle Geometry **(15 hours)**	**Relationships**	space Reasoning Measurement	Scientific and technical innovation **Exploration**: Human impact on the environment (what is the best shape for waste containers?)	The study of angle relationships and the properties of geometrical figures can lead to a better utilization of space through deductive reasoning and measurements.	A, D unit test	**Self-management: Organization: Use appropriate strategies for organizing complex information** **Critical thinking skills Gather and organize relevant information to formulate an argument.** **Draw reasonable conclusions and generalizations.**	Key terms --- theorems, radius, diameter, chord, bisector, cyclic, isosceles, tangent Circle theorems. Solve for sides and angles using theorems Construction a circle and label centre and radius Relate different angles to each other Identify the arc on which an angle at the center or circumference stands.

Year 5

Relations and Functions							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Relations and Functions **(30 hours)**	**Relationships**	Model Representation	**Scientific and technical innovation** **Exploration on: Models, processes**	**Mathematical representation and modeling are used to represent the relationships to understand the human impact on the environment**	**A, B, C, D Modelling stopping distance and braking distance.**	**Critical thinking skills** **Propose and evaluate a variety of solutions.** **Critical thinking skills: Draw reasonable conclusions and generalizations** **Communication skills** Understand and use mathematical notation Organize and depict information logically	**Knowledge**: main features of a function (domain, range, shape, x-intercepts, y-intercept, pattern). Sign diagram of functions. **Concepts**: Composite functions, the inverse of a function. Graphing different types of functions (quadratic, modulus, exponential, logarithmic) and understanding their characteristics. **Skills:** Find the points of intersection of functions. (Algebraically and graphically; using technology too). Use Special functions: Greatest integer, modulus, and identity function in real life problem solving.

Trigonometry							
Unit title an	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
trigonometry	**Relationships**	Model Representation	Scientific and technical innovation Exploration: systems, models, processes and solution Using math to model tides. And Ferris wheels.	**Solutions often develop from processes that use models to represent relationships that help us to discover the changes they undergo**	**A, B, D**	**Critical thinking skills** **Propose and evaluate a variety of solutions.** **Critical thinking skills** **Draw reasonable conclusions and generalizations.**	**Knowledge:** Trigonometric ratios, The area of triangle, The radian versus degree measure of an angle. The graph and the properties of trigonometric functions**.** **concept:** The True bearing, 3D models, The sine and cosine rules. The relationship between the sine and the cosine ratios in right angled triangle, and the transformations of the trigonometric functions**.** **skills :** Use trigonometric identities and relationship to model real life situations and solving real life problems.

Statistics							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
Health and Fitness	**Relationships**	Representation Quantity	**Identities and relationships** Exploration: Physical, health and well - being, lifestyle choices	**How quantities are represented can help to establish underlying relationships that can help to clarify trends among individuals.**	**A, B, C, D**	**Critical thinking skills** **Propose and evaluate a variety of solutions.** **Communication skills** Understand and use mathematical notation Organize and depict information logically **Information literacy** **Process data and report results**	Scatter plots Interpretation of scatter plots Correlation between two variables (BMI and heart rate) Pearson correlation coefficients Mean point and line of best fit Regression line equation is used to predict values (interpolation and extrapolation) Percentage error

Probability							
Unit title	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives**	**ATL skills**	**Content**
probability	**Logic**	**Generalization** **Validity** **Representation**	Identities and relationships Exploration personal efficacy and agency	Using logical representation to develop valid generalizations can influence our personal efficacy (what we think we can do) and thus our agency (what we can actually accomplish)	**A, B, C, D**	**Critical thinking skills** **Propose and evaluate a variety of solutions.** **Communication skills** Understand and use mathematical notation Organize and depict information logically **Information literacy Process data and report results**	**Experimental and theoretical probability** **Calculating probabilities of independent events, mutually exclusive events, and combined events** **Solving problems using tree diagrams and Venn diagrams** **Calculating conditional probability**