Subject Overview
Math

The study of mathematics is a fundamental part of a balanced education. It promotes a powerful universal language, analytical reasoning and problem-solving skills that contribute to the development of logical, abstract and critical thinking. Mathematics can help make sense of the world and allows phenomena to be described in precise terms. It also promotes careful analysis and the search for patterns and relationships, skills necessary for success both inside and outside the classroom. Mathematics, then, should be accessible to and studied by all students.

The following is the Global Maths Subject Group Overview (See P 48 of Principles to practice). The units address the math skills and content in the GIS Maths Curriculum which has been revised in 2018. The units may be revised through the year to match the updated curriculum.

Year 6								
Time Frame	**Unit title**	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives/Objective strands/Assessment criteria**	**ATL skills/skill indicators**	**Content (topics, knowledge, skills)**
6	Numbers, comparing and changing (Year 1)	Form	Equivalence , Systems	Fairness and Development	Making fair judgments is easier if we understand a variety of numeric systems and form.	A,B,C,D	Communication	Please see skill map below
6	Measurement (Year 1)	Form	Measurement and space	Identities and Relationships	Attributes of an object can be represented using metric and other standard measures	A,B,C,D	Critical thinking, Organization	
6	Pattern and Modeling (Year1)	Logic	Change, Pattern	Fairness and Development	A logical process is needed to see patterns around us	A,B,C	Critical thinking, Organization	
6	How can data help us.	Relationships	Generalization	Globalization and Sustainability	Statistics helps us to present global data/relationships in simpler way	A,B,C,D	Critical Thinking, Organization, reflection	
6	Introduction to Algebra (Year 1)	Relationships	Pattern, Generalization	Identities and Relationships	Identifying and using patterns and rules is the key to simplifying relationships, in life and in algebra.	A,B,C,D	Critical Thinking, Organization, reflection	
6	Shape-Mania (Year 1)	Form	Measurement, Quantity	Identities and Relationships	Geometry makes up our world	A,B,C,D	Creative Thinking	

Year 7								
Time Frame	**Unit title**	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives/Objective strands/Assessment criteria**	**ATL skills/skill indicators**	**Content (topics, knowledge, skills)**
6	Numbers, comparing and changing (Year 2)	Form	Representation, Change	Identities and Relationships	A number can be formed into different representations that have equal value	A,B,C,D	Communication	Please see skill map below
6	Measurement (Year 2)	Form	Measurement and space	Identities and Relationships	Attributes of an object can be represented using metric and other standard measures	A,B,C,D	Critical thinking, Organization	
6	Pattern and Modeling (Year 2)	Logic	Change, Pattern	Fairness and Development	A logical process is needed to see patterns around us	A,B,C,D	Critical thinking, Organization	
6	Data Around us	Relationships	Generalization	Globalization and Sustainability	Statistics helps us to present global data/relationships in simpler way	A,B,C,D	Critical Thinking, Organization, reflection	
6	Introduction to Algebra (Year 2)	Logic	Pattern, Generalization	Identities and Relationships	A logical process is needed to see patterns around us	A,B,C,D	Critical Thinking, Organization, reflection	
6	Shape-Mania (year 2)	Form	Measurement, Quantity	Identities and Relationships	Geometry makes up our world	A,B,C,D	Creative Thinking	

Year 8								
Time Frame	**Unit title**	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives/strands/Assessment criteria**	**ATL skills/skill indicators**	**Content (topics, knowledge, skills)**
6	Percentage	Relationships	Change, Quantity	Globalization, Sustainability	Numbers may affect the relationship between two quantities.	A,B,C,D	Communication, Information literacy, media literacy	Please see skill map below
6	Pythagorean Theorem	Logic	Measurement, Model	Scientific and Technical innovation	The Pythagorean Theorem is a fundamental relation in Euclidean geometry among the three sides of a right triangle.	A	Communication, Collaboration, Critical Thinking	
6	Algebra	Logic	Pattern, Representation	Identities and Relationships	Representation of symbol may communicate different meaning	A,B,C,D	Communication, Critical Thinking	
6	Coordinate Geometry	Logic	Justification, measurement, systems	Scientific and Technical	Logic is a tool to justify of what we discover through measurement and observation.	A,B,C,D	Communication	
6	Similarity and Congruence	Form	Change, Measurement	Identities and relationship	Two objects can be congruent, similar or neither.	A,C,D	Communication	
6	Statistics and Probability	Relationships	Generalizations and patterns	Identities and Relationships	How quantities are represented can help to establish underlying relationships and trends in a population.	A,B,C,D	Communication	

Year 9								
Time Frame	**Unit title**	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives/Assessment criteria**	**ATL skills/skill indicators**	**Content (topics, knowledge, skills)**
5	Why does algebra look so cleaver?	Relationship	Simplification	Identities and relationships	Finding and expressing things in common helps us to simplify and improve relationships.	A,B,C,D	Communication, Critical Thinking	Please see skill map below
5	Quadratic Equations	Relationships	Representation	Globalization and sustainability	Representing relationships visually and algebraically can allow us to find and optimize ´best case scenarios ‘ and sustainable solutions.	A,C,D	Organization	
5	Simultaneous equations	Relationships	Equivalence, systems	Identities and Relationships	How do we convert real life problems into simultaneous equations?	B,C,D	Communication, Organization, Reflection	
4	Can you walk the line ?	Logic	Equivalence	Orientation in space and time	Mathematical knowledge is built through logical structures, developed over time and transferred to equivalent situations.	A C D	Communication, Critical thinking	
5	Measuration	Form	Model, Space	Scientific and Technical innovation	Mensuration helps us to form and model mathematical shapes, contributing to innovation in science and technology.	A B C D	Critical Thinking	
5	What do I get by learning these things ?	Form	Justification	Orientation in space and time	Statements about the spaces and shapes around us can be justified to show they are invariant through space and time.	A B C D	Communication, Organization	
4	The only sure thing.	Logic	Measurement	Personal and Cultural expression	An individual´s understanding of risk and chance is highly dependent on both logic and their personal experience.	A B C D	Critical thinking	

Year 10								
Time Frame	**Unit title**	**Key concept**	**Related concepts**	**Global context**	**Statement of inquiry**	**Objectives/strands/Assessment criteria**	**ATL skills/skill indicators**	**Content (topics, knowledge, skills)**
7	Algebraic Expansion and Factorisation	Logic	Justification, pattern, simplification	Scientific and Technical innovation	Scientists use logic and patterns to make a decision.	A,B C,D	Communication, Critical thinking	Please see skill map below
7	Mathematics Radicals and Surds	Form	Representation, simplification	Identities and Relationships	Radicals and surds are important tool to find the exact values of what we discover through measurement.	A	Organization	
7	Mathematics Quadratic Equations	Relationships	Pattern, Representation	Fairness and Development	Quadratic equations are important to solve economics problems.	A, B,C D	Communication, Organization, Critical Thinking	
7	Mathematics Relation and Functions	Relationships	Generalize, Model	Scientific and Technical Innovations	Relations and functions are important tools to form a model leading to a conclusion.	A B C D	Communication, Organization, Critical Thinking	
6	Mathematics Exponential and Logarithmic Functions	Relationship	Model	Globalization and Sustainability	Exponential and Logarithmic functions are very commonly used to model population growth.	A	Communication Organization Affective skills	

MATHEMATICS CURRICULUM YEAR 6 (MYP 1)

FOR USE FROM AUGUST 2018 ONWARDS

YEAR 6	
CONTENT	LEARNING EXPERIENCE
NUMBER	
N1. NUMBERS AND THEIR OPERATIONS	Students should have opportunities to:
1.1 all types of numbers (whole, natural, integers etc.) 1.2 primes and prime factorization 1.3 finding HCF and LCM, introduction to squares numbers, cubes and square roots. 1.4 negative numbers, integers, rational numbers, real numbers and their four operations 1.5 representation and ordering of numbers on the number line 1.6 approximation and estimation (including rounding off numbers to a required number of decimal places.	• Understand difference between various types of numbers • Classify whole numbers based on their number of factors and explain why 0 and 1 are not primes • Discuss examples of negative numbers in the real world • Represent integers, rational numbers and real numbers on the number line as extension of whole numbers, fractions and decimals respectively. • Work in groups to estimate quantities (numbers and measures) in a variety of contexts, compare the estimates and share the estimation strategies. • Compare follow-through errors arising from intermediate values that are rounded to different degrees of accuracy. • Make estimates and check the reasonableness of answers obtained by calculators.
N2. RATIO AND PROPORTION	
2.1 comparison between two or more quantities by ratio 2.2 relationship between ratio and fraction 2.3 dividing a quantity in a given ratio 2.4 rations involving rational numbers 2.5 equivalent ratios 2.6 writing a ratio in its simplest form	• Discuss and explain how ratios are used in everyday life. • Use the concept of equivalent ratios to find the ratio a:b:c given the ratios a:b and b:c. • Make connections between ratios and fractions • Use appropriate mathematical language to describe the relationship, and use algebra to solve problems, for example: ▪ the ratio A to B is 2:3 can be represented as: A = 2x and B = 3x • the ratio of 2:3 means "2 units to 3 units" • A is $\frac{2}{3}$ of B or B is $\frac{3}{4}$ of A etc.

N3. PERCENTAGE	
3.1 expressing percentage as a fraction or decimal 3.2 expressing one quantity as a percentage of another 3.3 comparing two quantities by percentage 3.4 percentages greater than 100% 3.5 increasing/decreasing a quantity by a given percentage	• Collect examples of percentages from newspapers and magazines and discuss the meaning of percentage in each example. • Examine bills and receipts, etc. to find examples of the uses of percentages, e.g. discount, service charge, GST and other taxes and check the calculated values. • Make connections between percentages and fractions/decimals, e.g. " 25% of a quantity is ¼ " • Discuss misconceptions, e.g. "if A is 10% more than B, then B is 10% less than A"
N4. RATE AND SPEED	
4.1 relationships between distance , time and speed 4.2 writing speed in different units (e.g. km/h, m/min and cm/s) 4.3 concept of average rate, speed , constant speed and average speed	• Discuss examples of rates, e.g. currency exchange rates, interest rates, tax rates, etc. • Find out and compare the speeds of bicycles, cars, trains, airplanes and spaceships and their respective units to have a sense of their magnitude. • Explain the difference between average speed and constant speed and explain why average speed is not the average of speeds.
N5. SETS AND VENN DIAGRAM	
5.1 introduction to sets 5.2 introduction to basic vocabulary e.g. elements, null set, subset etc. 5.3 Drawing and interpreting Venn diagrams	• Read and represent sets in oral and written. • Find complement and intersection of sets.
ALGEBRA	

A1. ALGEBRAIC EXPRESSIONS AND FORMULAE	
1.1 using letters to represent numbers 1.2 interpreting notations: • ab as a × b • $\frac{a}{b}$ as a ÷ b or a × $\frac{1}{b}$ • a^3 = a. a. a = a × a × a etc. 1.3 evaluation of algebraic expressions and formulae 1.4 recognizing and representing patterns/relationships by finding an algebraic expression for the nth term 1.5 addition and subtraction of linear expressions 1.6 Simplification of linear expressions with integral coefficients Such as: 2(x-3y), 4x – 3(5x-2y) etc.	● Compare and examine the differences between pairs of expressions, e.g. 2n and 2 + n , n^2 and 2n, 2n^2 and (2n)^2 etc. ● Write algebraic expressions to express mathematical relationships, e.g. for the statement "there are 3 times as many boys as girls", if we let x be the number of girls, then the number of boys is 3x etc. ● Explore number patterns and write algebraic expressions to represent the patterns.
A2. FUNCTIONS AND GRAPHS	
2.1 Cartesian coordinates in two dimensions 2.2 graph of a set of ordered pairs as a representation of a relationship between two variables 2.3 Introduction to linear functions (y = ax + b)	● Play games, e.g. Battleship games, that involve the use if 2D cartesian coordinates to specify points ● Use a function machine to generate input and output values to illustrate the concept of function as "only one output for every input' and represent the function in tabular, graphical and algebraic forms. ● Use a linear function to represent the relationship between two variables (such as distance and time when the speed is constant), etc. Use a online graphic software to study how the graph of y = ax + b changes when either a or b varies.
A3. EQUATIONS AND INEQUALITIES	
3.1 concepts of equation and inequality 3.2 solving linear equations in one variable 3.3 formulating a linear equation in one variable to solve Problems 3.4 solving simple inequalities in the form ax < b, ax ≥ b etc.	● Formulate inequalities from real-world contexts ● Construct, simplify and solve linear equations with integral coefficients. ● Formulate equations to solve problems

A4. PROBLEMS IN REAL-LIFE CONTEXTS	
4.1 solving problems based on real-life contexts: • In everyday life (including travel plans, transport schedules, sports and games, recipes, etc.) • Involving personal and household finance (including simple interest, taxation, instalments, utilities bills, money exchange, etc.) 4.2 interpreting and analyzing data from tables and graphs, including distance-time and speed-time graphs 4.3 interpreting the solution in the context of the problem 4.4 identifying assumptions made and the limitations of the Solution	• Examine and make sense of data in a variety of contexts (including real data presented in graphs, tables and formulae/equations). • Work on tasks that incorporate some or all of the elements of the mathematical modelling process.
GEOMETRY AND TRIGONOMETRY	
G1. ANGLES, TRIANGLES AND POLYGONS	
1.1 acute, right, obtuse and reflex angles 1.2 vertically opposite angles, angles on a straight line, angles at a point 1.3 angles formed by two parallel lines and a transversal: corresponding, alternate, interior angles 1.4 properties of triangles, special quadrilaterals and regular polygons (pentagon, hexagon, etc.) including symmetry properties 1.5 classifying special quadrilateral on the basis of their properties 1.6 angle sum of interior and exterior angles of any convex polygon 1.7 properties of perpendicular bisectors of line segments and angle bisectors	• Investigate the properties relating the sides and angles of a triangle • Investigate the properties of polygons. • Investigate the sum of the interior and exterior angles of polygons and obtain the formulae for them. • Recognize symmetric properties (rotational and line symmetry) in some special quadrilaterals and regular polygons. • Justify whether a mathematical statement is true or false. • Use some interactive mode or GeoGebra software to construct and study the properties of the perpendicular bisector of a line segment and the bisector of an angle.

G2. MENSURATION	
2.1 draw the nets of cubes, cuboids, prisms and cylinders for the calculation of surface area. 2.2 problems involving perimeter and area of plane figures 2.3 volume and surface area of Prism and Cylinder	• Make connection between the area of a parallelogram and that of a rectangle, and between the area of a trapezium and that of a parallelogram, e.g. using paper folding/cutting. • Identify the height corresponding to any given side of a triangle or quadrilateral that is taken as the base. • Visualize and sketch 3D shapes from different views. • Visualize and draw the nets of cubes, cuboids, prisms and cylinders for the calculation of surface area.
G3. PROBLEMS IN REAL-LIFE CONTEXTS	
3.1 solving problems in real-life contexts (including floor plans, surveying, navigation, etc.) using geometry 3.2 interpreting the solution in the context of the problem 3.3 identifying the assumptions made and the limitations of the solution	• Work on tasks that incorporate some or all elements of the mathematical modelling process.
STATISTICS AND PROBABILITY	
S1. DATA ANALYSIS	
1.1 analysis and interpretation of: • tables • bar graphs • pictograms • line graphs • pie charts 1.2 purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.3 explaining why a given statistical diagram leads to misinterpretation of data	• construct tables, bar graphs, pictograms, line graphs and pie charts from given data. • Work collaboratively on a task to: ▪ Collect and classify data ▪ Present data using an appropriate statistical representation ▪ Analyze data • Compare various statistical representations and justify why a particular representation is more suitable than others for a given situation • Use data to make informed decisions, predictions and inferences.

S2. PROBABILITY	
2.1 probability as a measure of chance 2.2 probability of single events (including listing all the possible outcomes in a simple chance situation to calculate the probability) 2.3 use of Venn diagram	• Discuss the concept of probability (or chance) using everyday events, including simple experiments, e.g. tossing a coin, and use language such as "certain", "likely" and "unlikely". • Compare and discuss the experimental and theoretical values of probability using some group activities.

MATHEMATICS CURRICULUM YEAR 7 (MYP 2)

FOR USE FROM AUGUST 2018 ONWARDS

YEAR 7	
CONTENT	LEARNING EXPERIENCE
NUMBER	
N1. NUMBERS AND THEIR OPERATIONS	Students should have opportunities to:
1.7 all types of numbers (whole, natural, integers etc.) 1.8 primes and prime factorization 1.9 finding HCF and LCM, squares, cubes, square roots and cube roots by prime factorization 1.10 negative numbers, integers, rational numbers, real numbers and their four operations 1.11 calculations with calculator (Casio FX 991ES) 1.12 representation and ordering of numbers on the number line 1.13 use of $<$, $>$, $\leq$, $\geq$ (inequalities) 1.14 approximation and estimation (including rounding off numbers to a required number of decimal places, and estimating the results of computation) 1.15 introduce significant figures (focus on 3 significant figures)	• Understand difference between various types of numbers • Classify whole numbers based on their number of factors and explain why 0 and 1 are not primes • Discuss examples of negative numbers in the real world • Represent integers, rational numbers and real numbers on the number line as extension of whole numbers, fractions and decimals respectively. • Work in groups to estimate quantities (numbers and measures) in a variety of contexts, compare the estimates and share the estimation strategies. • Compare follow-through errors arising from intermediate values that are rounded to different degrees of accuracy. • Make estimates and check the reasonableness of answers obtained by calculators.
N2. RATIO AND PROPORTION	

2.7 comparison between two or more quantities by ratio 2.8 relationship between ratio and fraction 2.9 dividing a quantity in a given ratio 2.10 rations involving rational numbers 2.11 equivalent ratios 2.12 writing a ratio in its simplest form 2.13 word problems involving ratio	• Discuss and explain how ratios are used in everyday life. • Use the concept of equivalent ratios to find the ratio a:b:c given the ratios a:b and b:c. • Make connections between ratios and fractions • Use appropriate mathematical language to describe the relationship, and use algebra to solve problems, for example: ▪ the ratio A to B is 2:3 can be represented as: A = 2x and B = 3x • the ratio of 2:3 means "2 units to 3 units" • A is $\frac{2}{3}$ of B or B is $\frac{3}{4}$ of A etc.

N3. PERCENTAGE	
3.6 expressing percentage as a fraction or decimal 3.7 expressing one quantity as a percentage of another 3.8 comparing two quantities by percentage 3.9 percentages greater than 100% 3.10 increasing/decreasing a quantity by a given percentage 3.11 finding percentage increase/decrease 3.12 reverse percentages 3.13 word problems involving percentages	• Collect examples of percentages from newspapers and magazines and discuss the meaning of percentage in each example. • Examine bills and receipts, etc. to find examples of the uses of percentages, e.g. discount, service charge, GST and other taxes and check the calculated values. • Make connections between percentages and fractions/decimals, e.g. " 25% of a quantity is ¼ of the quantity", "20% of x is 0.2x" etc. • Discuss misconceptions, e.g. "if A is 10% more than B, then B is 10% less than A"
N4. RATE AND SPEED	
4.4 relationships between distance , time and speed 4.5 writing speed in different units (e.g. km/h, m/min and cm/s) 4.6 concept of average rate, speed , constant speed and average speed 4.7 conversion of units (e.g. km/h to m/s and vice versa) 4.8 calculation of speed, distance or time given the other two Quantities 4.9 problems involving rate and speed	• Discuss examples of rates, e.g. currency exchange rates, interest rates, tax rates, etc. • Find out and compare the speeds of bicycles, cars, trains, airplanes and spaceships and their respective units to have a sense of their magnitude. • Explain the difference between average speed and constant speed and explain why average speed is not the average of speeds.
N5. SETS AND VENN DIAGRAM	
5.4 introduction to sets 5.5 introduction to basic vocabulary e.g. elements, null set, subset etc. 5.6 Drawing and interpreting Venn diagrams 5.7 using Venn diagrams to solve problems in real-life context	• Read and represent sets in oral and written. • Find compliment and intersection of sets. • Solve real-life problems using Venn diagram.
ALGEBRA	

A1. ALGEBRAIC EXPRESSIONS AND FORMULAE	
1.7 using letters to represent numbers 1.8 interpreting notations: • ab as a × b • $\frac{a}{b}$ as a ÷ b or a × $\frac{1}{b}$ • a^3 = a. a. a = a × a × a etc. 1.9 evaluation of algebraic expressions and formulae 1.10 translation of simple real-world situations into algebraic expression 1.11 recognizing and representing patterns/relationships by finding an algebraic expression for the nth term 1.12 addition and subtraction of linear expressions 1.13 Simplification of linear expressions with integral coefficients Such as: 2(x-3y), 4x – 3(5x-2y) etc. 1.14 use brackets and extract common factors	Compare and examine the differences between pairs of expressions, e.g. 2n and 2 + n , n^2 and 2n, 2n^2 and (2n)^2 etc. Write algebraic expressions to express mathematical relationships, e.g. for the statement "there are 3 times as many boys as girls", if we let x be the number of girls, then the number of boys is 3x etc. Explore number patterns and write algebraic expressions to represent the patterns.
A2. FUNCTIONS AND GRAPHS	
2.1 Cartesian coordinates in two dimensions 2.2 graph of a set of ordered pairs as a representation of a relationship between two variables 2.4 linear functions (y = ax + b) 2.5 graph of linear functions 2.6 the gradient of a linear graph as the ratio of the vertical change to the horizontal change (+ and – gradients)	Play games, e.g. Battleship games, that involve the use if 2D cartesian coordinates to specify points Use a function machine to generate input and output values to illustrate the concept of function as "only one output for every input' and represent the function in tabular, graphical and algebraic forms. Use a linear function to represent the relationship between two variables (such as distance and time when the speed is constant), etc. Use a online graphic software to study how the graph of y = ax + b changes when either a or b varies.
A3. EQUATIONS AND INEQUALITIES	
3.1 concepts of equation and inequality 3.2 solving linear equations in one variable 3.3 formulating a linear equation in one variable to solve Problems 3.4 solving simple inequalities in the form ax < b, ax ≥ b etc.	Formulate inequalities from real-world contexts Construct, simplify and solve linear equations with integral coefficients. Formulate equations to solve problems

3.5 solving simple fractional equations that can be reduced to linear equations such as $\frac{x}{3}+\frac{x-2}{4}=5$, $\frac{5}{x-3}=10$ $etc.$	
A4. PROBLEMS IN REAL-LIFE CONTEXTS	
4.5 solving problems based on real-life contexts: • In everyday life (including travel plans, transport schedules, sports and games, recipes, etc.) • Involving personal and household finance (including simple interest, taxation, instalments, utilities bills, money exchange, etc.) 4.6 interpreting and analyzing data from tables and graphs, including distance-time and speed-time graphs 4.7 interpreting the solution in the context of the problem 4.8 identifying assumptions made and the limitations of the Solution	• Examine and make sense of data in a variety of contexts (including real data presented in graphs, tables and formulae/equations). • Work on tasks that incorporate some or all of the elements of the mathematical modelling process.
GEOMETRY AND TRIGONOMETRY	
G1. ANGLES, TRIANGLES AND POLYGONS	
1.8 acute, right, obtuse and reflex angles 1.9 vertically opposite angles, angles on a straight line, angles at a point 1.10 angles formed by two parallel lines and a transversal: corresponding, alternate, interior angles 1.11 properties of triangles, special quadrilaterals and regular polygons (pentagon, hexagon, etc.) including symmetry properties 1.12 classifying special quadrilateral on the basis of their properties 1.13 angle sum of interior and exterior angles of any convex polygon 1.14 properties of perpendicular bisectors of line segments and angle bisectors 1.2 construction of simple geometrical figures from given data (including perpendicular bisectors and angle bisectors) using compasses, ruler, set squares and protractors, where appropriate	• Investigate the properties relating the sides and angles of a triangle • Investigate the properties of polygons. • Investigate the sum of the interior and exterior angles of polygons and obtain the formulae for them. • Recognize symmetric properties (rotational and line symmetry) in some special quadrilaterals and regular polygons. • Justify whether a mathematical statement is true or false. • Use some interactive mode or GeoGebra software to construct and study the properties of the perpendicular bisector of a line segment and the bisector of an angle.

G2. MENSURATION	
2.4 area of Parallelogram and Trapezium 2.5 problems involving perimeter and area of plane figures 2.6 volume and surface area of Prism and Cylinder 2.7 conversion between cm^2 and m^2, and cm^3 and m^3 2.8 problems involving volume and surface area of composite solids	• Make connection between the area of a parallelogram and that of a rectangle, and between the area of a trapezium and that of a parallelogram, e.g. using paper folding/cutting. • Identify the height corresponding to any given side of a triangle or quadrilateral that is taken as the base. • Visualize and sketch 3D shapes from different views. • Visualize and draw the nets of cubes, cuboids, prisms and cylinders for the calculation of surface area.
G3. PROBLEMS IN REAL-LIFE CONTEXTS	
3.4 solving problems in real-life contexts (including floor plans, surveying, navigation, etc.) using geometry 3.5 interpreting the solution in the context of the problem 3.6 identifying the assumptions made and the limitations of the solution	• Work on tasks that incorporate some or all elements of the mathematical modelling process.
STATISTICS AND PROBABILITY	
S1. DATA ANALYSIS	
1.4 analysis and interpretation of: • tables • bar graphs • pictograms • line graphs • pie charts 1.5 purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.6 explaining why a given statistical diagram leads to misinterpretation of data	• construct tables, bar graphs, pictograms, line graphs and pie charts from given data. • Work collaboratively on a task to: ▪ Collect and classify data ▪ Present data using an appropriate statistical representation ▪ Analyze data • Compare various statistical representations and justify why a particular representation is more suitable than others for a given situation • Use data to make informed decisions, predictions and inferences.

S2. PROBABILITY	
2.4 probability as a measure of chance 2.5 probability of single events (including listing all the possible outcomes in a simple chance situation to calculate the probability) 2.6 tree diagram 2.7 use of Venn diagram	• Discuss the concept of probability (or chance) using everyday events, including simple experiments, e.g. tossing a coin, and use language such as "certain", "likely" and "unlikely". • Compare and discuss the experimental and theoretical values of probability using some group activities.

YEAR 8	
Content	Learning Experience
NUMBER	
N2. RATIO AND PROPORTION	Students should have opportunities to:
2.8 Map scales (distance and area) 2.9 Direct and inverse proportion	• Interpret the various scales used on maps, floor plans and other scale drawings, and calculate the actual distance/length and area. • Work in groups to make a scale drawing of an existing or dream classroom/bedroom and explain the choice of the scale used. • Discuss examples of direct and inverse proportion and explain the concepts using tables, equations and graphs.
ALGEBRA	
A1. ALGEBRAIC EXPRESSIONS AND FORMULAE	
1.9 expansion of the product of algebraic expressions 1.10 changing the subject of a formula 1.11 finding the value of an unknown quantity in a given Formula 1.12 use of: • $(a + b)^2 = a^2 + 2ab + b^2$ • $(a - b)^2 = a^2 - 2ab + b^2$ • $a^2 - b^2 = (a + b)(a - b)$ 1.13 factorization of linear expressions of the form $ax + bx + kay + kby$ 1.14 factorization of quadratic expressions $ax^2 + bx + c$ 1.15 multiplication and division of simple algebraic fractions	• Explain the process of expanding the product of two linear expressions of the form $ax + b$, where a and b are integers, to obtain a quadratic expression of the form $ax^2 + bx + c$ • Work in groups to identify and explain common errors in algebraic manipulations, e.g. $(x + y)^2 = x^2 + y^2$

uch as $\left(\frac{3a}{5b^2}\right)\left(\frac{15ab}{6}\right)$etc. 1.16 addition and subtraction of algebraic fractions with linear or quadratic denominator such as $\frac{1}{x-2}+\frac{3}{x-5}$, $\frac{1}{x^2-9}+\frac{3}{x-3}$ etc.	
A2. FUNCTIONS AND GRAPHS	
2.6 quadratic functions $y = ax^2 + bx + c$ 2.7 graphs of quadratic functions and their properties: • Positive or negative coefficient of x^2 • Maximum and minimum points • Symmetry	• Use an online graphic software/interactive mode to study how the graph of $y = ax^2 + bx + c$ changes when either a, b or c varies.
A3. EQUATIONS AND INEQUALITIES	
3.6 graphs of linear equations in two variables ($ax + bx = c$) 3.7 solving simultaneous linear equations in two variables by: • Substitution and elimination methods • Graphical method 3.8 solving quadratic equations in one variable by factorization 3.9 formulating a pair of linear equations in two variables to solve problems	• Use some interactive mode to draw the graph of $ax + bx = c$ (a straight line), check that the coordinates of a point on the straight line satisfy the equation, and explain why the solution of a pair of simultaneous linear equations is the point of intersection of two straight lines. • Draw the lines $x = a$ and $x = b$, and describe the lines and their gradients.
A4. PROBLEMS IN REAL-LIFE CONTEXTS	
4.1 solving problems based on real-life contexts: • In everyday life (including travel plans, transport schedules, sports and games, recipes, etc.) • Involving personal and household finance (including simple interest, taxation, instalments, utilities bills, money exchange, etc.) 4.2 interpreting and analyzing data from tables and graphs, including distance-time and speed-time graphs 4.3 interpreting the solution in the context of the problem 4.4 identifying assumptions made and the limitations of the	• Examine and make sense of data in a variety of contexts (including real data presented in graphs, tables and formulae/equations). • Work on tasks that incorporate some or all of the elements of the mathematical modelling process.

Solution (These real-life problems will be similar to those covered in Y7 but having more parameters and complicated!)	
GEOMETRY AND TRIGONOMETRY	
G1. CONGRUENCE AND SIMILARITY	
1.9 Congruent figures 1.10 Similar figures 1.11 Properties of similar triangle and polygons: • Corresponding angles are equal • Corresponding sides are proportional 1.12 enlargement and reduction of a plane figure 1.13 scale drawings 1.14 solving simple problems involving congruence and similarity	• examine whether two figures are congruent, by checking if one figure can be mapped onto the other figure under translation, rotation, and reflection. • Identify similar triangles/rectangles from cut-outs of triangles/rectangles and why they are similar. • Identify and suggest applications of congruence and similarity in real- life contexts, e.g. photocopying, tessellation patterns, etc.
G2. MENSURATION	
2.6 volume and surface area of pyramid, cone and sphere	• visualize and make connections between the volumes of pyramid and cone, and the volumes of pyramid/cone and the related prism/cylinder. • Make sense of the formulae for the volume and surface area of a sphere, e.g. by relating to the formulae for the volume and curved surface area of the related cylinder.
G3. PYTHAGOREAN“’ THEOREM	
3.1 Use of Pythagoras’ theorem 3.2 determining whether a triangle is right-angled given the lengths of three sides 3.3 use of trigonometric ratios (sine, cosine and tangent) of acute angles to calculate unknown sides and angles in right-angled triangles	• Either (i) use a string of length 12 units (e.g. 1 unit = 10cm) to form a right-angled triangle with sides of whole-unit lengths (e.g. 3, 4 and 5 units) and find out if there is a relationship between the three sides; or (ii) use cut-out pieces of two squares with sides of 3 and 4 units respectively to form a square of sides 5 units. • Discuss the use of trigonometric ratios in real life, e.g. finding the height of a tree/a building by measuring the angle of elevation with a clinometer.

G4. PROBLEMS IN REAL-LIFE CONTEXTS	
4.1 solving problems in real-life contexts (including floor plans, surveying, navigation, etc.) using geometry 4.2 interpreting the solution in the context of the problem 4.3 identifying the assumptions made and the limitations of the Solution	• Work on tasks that incorporate some or all elements of the mathematical modelling process.
STATISTICS AND PROBABILITY	
S1. DATA ANALYSIS	
1.4 analysis and interpretation of: • dot diagrams • histograms • stem-and-leaf diagram 1.5 purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.6 explaining why a given statistical diagram leads to misinterpretation of data 1.15 mean, mode and median as measures of central tendency for a set of data 1.16 purpose and uses of mean, mode and median 1.17 calculation of the mean for grouped data	• construct dot diagram, histograms (including equal and unequal class intervals) and stem-and-leaf diagrams from given data. • Predict, observe and explain how the different measures of central tendency are affected by changing data values. • Discuss the appropriate use of the measures of central tendency in different contexts.
S2. PROBABILITY	
2.1 probability as a measure of chance 2.2 probability of single events (including listing all the possible outcomes in a simple chance situation to calculate the probability) 2.3 tree diagram 2.4 use of Venn diagram (similar to Y7 but with more complicated problems)	• Discuss the concept of probability (or chance) using everyday events, including simple experiments, e.g. tossing a coin, and use language such as "certain", "likely" and "unlikely". • Compare and discuss the experimental and theoretical values of probability using some group activities.

MATHEMATICS CURRICULUM YEAR 9 (MYP 4)

FOR USE FROM AUGUST 2018 ONWARDS

YEAR 9	
Content	Learning Experience
NUMBER	
N1. NUMBERS AND THEIR OPERATIONS	Students should have opportunities to:
1.8 Use of standard form A × 10^n , where n is an integer, and $1 \leq A \leq 10$ 1.9 positive, negative, zero and fractional indices 1.10 laws of indices	• Discuss examples of very large and very small numbers, e.g. world population in billions (10^9) and size of atom in nanometers (10^{-9}), and express the numbers in standard form. • Describe and compare numbers written in index form, e.g. "which is greater, 2^{10} or 10^2?", and explain how to multiply and divide such numbers using the laws of indices.
ALGEBRA	
A1. ALGEBRAIC EXPRESSIONS AND FORMULAE	
1.9 expansion of the product of algebraic expressions 1.10 changing the subject of a formula 1.11 finding the value of an unknown quantity in a given Formula 1.12 use of: • $(a + b)^2 = a^2 + 2ab + b^2$ • $(a - b)^2 = a^2 - 2ab + b^2$ • $a^2 - b^2 = (a + b)(a - b)$ 1.13 factorization of linear expressions of the form $ax + bx + kay + kby$ 1.14 factorization of quadratic expressions $ax^2 + bx + c$ 1.15 multiplication and division of simple algebraic fractions such as $\left(\frac{3a}{5b^2}\right)\left(\frac{15ab}{6}\right)$ etc. 1.16 addition and subtraction of algebraic fractions with linear or quadratic denominator such as $\frac{1}{x-2} + \frac{3}{x-5}$, $\frac{1}{x^2-9} + \frac{3}{x-3}$ etc.	• Explain the process of expanding the product of two linear expressions of the form ax + b, where a and b are integers, to obtain a quadratic expression of the form $ax^2 + bx + c$ • Work in groups to identify and explain common errors in algebraic manipulations, e.g. $(x + y)^2 = x^2 + y^2$

A2. FUNCTIONS AND GRAPHS	
2.6 quadratic functions $y = ax^2 + bx + c$ 2.7 graphs of quadratic functions and their properties: • Positive or negative coefficient of x^2 • Maximum and minimum points • Symmetry 2.8 sketching the graphs of quadratic functions given in the form: • $y = (x - p)^2 + q$ • $y = -(x - p)^2 + q$ • $y = (x - p)(x - q)$, etc. 2.9 graphs of power functions $y = ax$, where $n = -2, -1, 0, 1$ 2.10 graphs of exponential functions $y =$, where a is a positive integer 2.11 estimation of the gradient of a curve by drawing a tangent	• Use an online graphic software/interactive mode to study how the graph of $y = ax^2 + bx + c$ changes when either a, b or c varies. • Use Graphmatica or other graphing software to explore the characteristics of various functions • Work in groups to match and justify sketches of graphs with their respective functions.
A3. EQUATIONS AND INEQUALITIES	
3.10 solving quadratic equations in one variable by: • Use of formula • Completing the square for $y = x^2 + px + q$ • Graphical method 3.11 solving fractional equations that can be reduced to quadratic equations such as $\frac{10}{x-6} = x + 4$, etc. 3.12 formulating a quadratic equation in one variable to solve Problems 3.13 solving linear inequalities in one variable, and representing the solution on the number line	• Explain why there are no real solutions to a quadratic equation $ax^2 + bx + c = 0$ when $b^2 - 4ac$ is negative. • Compare the methods of solving a linear inequality and the corresponding linear equation, and their solutions.

A4. SEQUENCE AND SERIES	
4.1 Developing, and justifying or proving, general rules/ formulae for sequences • Arithmetic sequence • Geometric sequence 4.2 Finding the sum of the series, including infinite series	• use tables to represent a repeating-pattern situation • generalize and explain patterns and relationships in words and numbers • write arithmetic/geometric expressions for particular terms in a sequence
A5. PROBLEMS IN REAL-LIFE CONTEXTS	
5.1 solving problems based on real-life contexts: • In everyday life (including travel plans, transport schedules, sports and games, recipes, etc.) • Involving personal and household finance (including simple interest, taxation, instalments, utilities bills, money exchange, etc.) 5.2 interpreting and analyzing data from tables and graphs, including distance-time and speed-time graphs 5.3 interpreting the solution in the context of the problem 5.4 identifying assumptions made and the limitations of the Solution (These real-life problems will be like those covered in Y8 but having more parameters and complicated!)	• Examine and make sense of data in a variety of contexts (including real data presented in graphs, tables and formulae/equations). • Work on tasks that incorporate some or all of the elements of the mathematical modelling process.
GEOMETRY AND TRIGONOMETRY	
G1. CONGRUENCE AND SIMILARITY	
1.4 enlargement and reduction of a plane figure 1.5 scale drawings 1.6 solving simple problems involving congruence and similarity 1.7 determining whether two triangles are: • congruent • similar 1.8 ratio of areas of similar plane figures 1.9 ratio of volumes of similar solids	• Identify and suggest applications of congruence and similarity in real- life contexts, e.g. photocopying, tessellation patterns, etc. • Construct triangles with given conditions, e.g. "3 sides", "3 angles", "2 sides, 1 angle" etc. and examine what conditions are necessary for congruency/similarity.

G2. MENSURATION	
2.7 arc length as fraction of the circumference and sector area as fraction of the area of a circle 2.8 area of a segment 2.9 use of radian measure of acute (including conversion between radians and degree) 2.10 problems involving the arc length, sector area of a circle and area of a segment	• Find the arc length and sector area by considering them as fractions of the circumference and area of circle respectively. • Visualize the size of an angle of 1 radian and estimate the size of angles in radians.
G3. PYTHAGOREAN“’ THEOREM AND TRIGONOMETRY	
3.1 Use of Pythagoras’ theorem 3.2 determining whether a triangle is right-angled given the lengths of three sides 3.3 use of trigonometric ratios (sine, cosine and tangent) of acute angles to calculate unknown sides and angles in right-angled triangles 3.4 use of the formula ½ for the area of triangle (similar to Y8 but with extended problems on T-ratios)	• Either (i) use a string of length 12 units (e.g. 1 unit = 10cm) to form a right-angled triangle with sides of whole-unit lengths (e.g. 3, 4 and 5 units) and find out if there is a relationship between the three sides; or (ii) use cut-out pieces of two squares with sides of 3 and 4 units respectively to form a square of sides 5 units. • Discuss the use of trigonometric ratios in real life, e.g. finding the height of a tree/a building by measuring the angle of elevation with a clinometer.
G4. PROPERTIES OF CIRCLES	
.1 symmetry properties of circles: • Equal chords are equidistant from the Centre • The perpendicular bisector of a chord passes through the centre • Tangents from an external point are equal in length • The line joining an external point to the centre of the circle bisects the angle between the tangents .2 angle properties of circles: • Angle in a semicircle is a right angle • Angle between tangent and radius of a circle is a right angle • Angle at the centre is twice the angle at the circumference • Angles in the same segment are equal Angle s in opposite segments are supplementary	• Use paper folding to visualize symmetric properties of circles, e.g. the perpendicular bisector of a chord passes through the centre. • Use GeoGebra or other dynamic geometry software to explore the properties of circles, and use geometrical terms correctly for effective communication.

G5. COORDINATE GEOMETRY	
5.1 finding the gradient of a straight line given the coordinates of two points on it 5.2 finding the length of a line segment given the coordinates of its end points 5.3 interpreting and finding the equation of a straight-line graph in the form y = mx + c 5.4 geometric problems involving the use of coordinates	• Extend their intuitive understanding of gradient as ratio of vertical change to horizontal change to a formal treatment using the coordinates of two points on the line • Use Graphmatica or other dynamic geometry software to explore and describe the gradients of straight lines, including the gradient of a vertical line as undefined.
G6. PROBLEMS IN REAL-LIFE CONTEXTS	
6.1 solving problems in real-life contexts using coordinates 6.2 interpreting the solution in the context of the problem 6.3 identifying the assumptions made and the limitations of the solution	• Work on tasks that incorporate some or all elements of the mathematical modelling process.
STATISTICS AND PROBABILITY	
S1. DATA ANALYSIS	
1.10 Quartiles and percentiles 1.11 Range, interquartile range and standard deviation as measure of spread for a set of data 1.12 Analysis and interpretation of: ▪ Box-and whisker plots ▪ Cumulative frequency diagrams 1.13 purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.14 calculation of the standard deviation for a set of data (grouped and ungrouped)	• compare the means and standard deviations of two sets of data • discuss examples of inappropriate representations of data from newspapers and other sources, e.g. whether certain representations are misleading.
S2. PROBABILITY	
2.5 probability of simple combined events (including using possibility diagrams and tree diagrams, where appropriate) 2.6 addition and multiplication of probabilities (mutually exclusive events and independent events)	• Discuss and differentiate between mutually exclusive and non-mutually exclusive events, and between independent and dependent events.

MATHEMATICS
CURRICULUM
YEAR 10
STANDARD
(MYP5)

FOR USE FROM AUGUST 2018 ONWARDS

YEAR 10 STANDARD	
Content	Learning Experience
NUMBER	
N1. NUMBERS AND THEIR OPERATIONS	Students should have opportunities to:
1.8 Use of standard form $A \times 10^n$, where n is an integer, and $1 \leq A \leq 10$ 1.9 positive, negative, zero and fractional indices 1.10 laws of indices 1.11 laws of logarithm	• Discuss examples of very large and very small numbers, e.g. world population in billions (10^9) and size of atom in nanometers (10^{-9}), and express the numbers in standard form. • Describe and compare numbers written in index form, e.g. "which is greater, 2^{10} or 10^2?", and explain how to multiply and divide such numbers using the laws of indices. • Discuss between common and natural logarithms
ALGEBRA	
A1. ALGEBRAIC EXPRESSIONS AND FORMULAE	
1.9 expansion of the product of algebraic expressions 1.10 changing the subject of a formula 1.11 finding the value of an unknown quantity in a given Formula 1.12 use of: • $(a + b)^2 = a^2 + 2ab + b^2$ • $(a - b)^2 = a^2 - 2ab + b^2$ • $a^2 - b^2 = (a + b)(a - b)$ 1.13 factorization of linear expressions of the form 1.14 factorization of quadratic expressions $ax^2 + bx + c$	• Explain the process of expanding the product of two linear expressions of the form ax + b, where a and b are integers, to obtain a quadratic expression of the form $ax^2 + bx + c$ • Work in groups to identify and explain common errors in algebraic manipulations, e.g. $(x + y)^2 = x^2 + y^2$

1.15 multiplication and division of simple algebraic fractions such as $\left(\frac{3a}{5b^2}\right)\left(\frac{15ab}{6}\right)$etc. addition and subtraction of algebraic fractions with linear or quadratic denominator such as$\frac{1}{x-2}+\frac{3}{x-5}$,$\frac{1}{x^2-9}+\frac{3}{x-3}$etc.	
A2. FUNCTIONS AND GRAPHS	
2.6 quadratic functions $y = ax^2 + bx + c$ 2.7 graphs of quadratic functions and their properties: • Positive or negative coefficient of x^2 • Maximum and minimum points • Symmetry 2.8 sketching the graphs of quadratic functions given in the form: • $y = (x - p)^2 + q$ • $y = -(x - p)^2 + q$ • $y = (x - p)(x - q)$, etc. 2.9 graphs of power functions $y = ax$, where $n = -2, -1, 0, 1$ 2.10 graphs of exponential functions $y = ka^x$, where a is a positive integer 2.11 estimation of the gradient of a curve by drawing a tangent 2.12 exponential and logarithmic functions 2.13 graphs based on exponential and logarithms • Growth and decay 2.14 transformations of functions, e.g. translation, stretches and reflection, etc.	• Use an online graphic software/interactive mode to study how the graph of $y = ax^2 + bx + c$ changes when either a, b or c varies. • Use Graphmatica or other graphing software to explore the characteristics of various functions • Work in groups to match and justify sketches of graphs with their respective functions. • Use of GDC to study how the graphs of exponential and logarithmic functions changes when various parameters vary. • Describing and analyzing transformed logarithmic, rationale (of the form $f(x) = 1/x$), etc.
A3. EQUATIONS AND INEQUALITIES	
3.10 solving quadratic equations in one variable by: • Use of formula • Completing the square for $y = x^2 + px + q$	• Explain why there are no real solutions to a quadratic equation $ax^2 + bx + c = 0$ when $b^2 - 4ac$ is negative.

• Graphical method 3.11 solving fractional equations that can be reduced to quadratic equations such as $\frac{10}{x-6}$ = x + 4, etc. 3.12 formulating a quadratic equation in one variable to solve Problems 3.13 solving linear inequalities in one variable, and representing the solution on the number line	• Compare the methods of solving a linear inequality and the corresponding linear equation, and their solutions.
A4. SEQUENCE AND SERIES	
4.1 Developing, and justifying or proving, general rules/ formulae for sequences • Arithmetic sequence • Geometric sequence 4.2 Finding the sum of the series, including infinite series	• use tables to represent a repeating-pattern situation • generalize and explain patterns and relationships in words and numbers • write arithmetic/geometric expressions for terms in a sequence
A5. PROBLEMS IN REAL-LIFE CONTEXTS	
5.1 solving problems based on real-life contexts: • In everyday life (including population growth, decrease in price etc.) • Problem based on optimization, etc. 5.2 interpreting and analyzing data from tables and graphs 5.3 interpreting the solution in the context of the problem 5.4 identifying assumptions made and the limitations of the Solution	• Examine and make sense of data in a variety of contexts (including real data presented in graphs, tables and formulae/equations). • Work on tasks that incorporate some or all the elements of the mathematical modelling process.
GEOMETRY AND TRIGONOMETRY	
G2. MENSURATION	
2.7 arc length as fraction of the circumference and sector area as fraction of the area of a circle 2.8 area of a segment 2.9 use of radian measure of acute (including conversion between radians and degree)	• Find the arc length and sector area by considering them as fractions of the circumference and area of circle respectively. • Visualize the size of an angle of 1 radian and estimate the size of angles in radians.

2.10 problems involving the arc length, sector area of a circle and area of a segment	
G3. PYTHAGOREAN THEOREM	
3.4 use of the formula ½ for the area of triangle 3.5 introduction of all three T-ratios, e.g. sin, cos, tan 3.6 solution of triangle using: • Sine rule • Cosine rule 3.7 introduction of unit circle	• Using the sine and cosine rules to solve problems. • Finding the exact value of trigonometric functions of special angles. • Using radians to solve problems, where appropriate.
G5. COORDINATE GEOMETRY	
5.5 introduction of 3D geometry 5.6 use of following formulae: • Distance between two points • Midpoint 5.7 geometric problems involving the use of 3D coordinates	
G6. PROBLEMS IN REAL-LIFE CONTEXTS	
6.1 solving problems in real-life contexts using coordinates 6.2 interpreting the solution in the context of the problem 6.3 identifying the assumptions made and the limitations of the solution	• Work on tasks that incorporate some or all elements of the mathematical modelling process.
STATISTICS AND PROBABILITY	
S1. DATA ANALYSIS	
1.15 Quartiles and percentiles 1.16 Range, interquartile range and standard deviation as measure of spread for a set of data 1.17 Analysis and interpretation of: ▪ Box-and whisker plots ▪ Cumulative frequency diagrams 1.18 purposes and uses, advantages and disadvantages of the different forms of statistical representations	• compare the means and standard deviations of two sets of data • discuss examples of inappropriate representations of data from newspapers and other sources, e.g. whether certain representations are misleading.

1.19 calculation of the standard deviation for a set of data (grouped and ungrouped)	
S2. PROBABILITY	
2.5 probability of simple combined events (including using possibility diagrams and tree diagrams, where appropriate) 2.6 addition and multiplication of probabilities (mutually exclusive events and independent events) 2.7 conditional probability 2.8 probability of successive trials	• Discuss and differentiate between mutually exclusive and non-mutually exclusive events, and between independent and dependent events.

MATHEMATICS CURRICULUM YEAR 10
EXTENDED (MYP 5)

FOR USE FROM AUGUST 2018 ONWARDS

YEAR 10 EXTENDED	
Content	Learning Experience
NUMBER	
N1. NUMBERS AND THEIR OPERATIONS	Students should have opportunities to:
1.10 laws of indices 1.11 Logarithms with different base number (including natural logarithms) 1.12 change of base	• Discuss between common and natural logarithms • Describe and compare distinct types of bases. • Discuss how to use change of base formula.
ALGEBRA	
A1. ALGEBRAIC EXPRESSIONS AND FORMULAE	
1.17 use of: • $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ • $(a - b)^3 = a^3 - 3a^2b + 3ab^2 + b^3$ • $a^2 - b^2 = (a + b)(a - b)$ 1.18 factorization of $a^3 \pm b^3$ 1.19 partial fraction	• Use of partial fraction in calculus
A2. FUNCTIONS AND GRAPHS	
2.12 exponential and logarithmic functions 2.13 graphs based on exponential and logarithms • Growth and decay 2.14 transformations of functions, e.g. translation, stretches and reflection, etc.	• Use of GDC to study how the graphs of exponential and logarithmic functions changes when various parameters vary. • Describing and analyzing transformed logarithmic, rationale (of the form $f(x) = 1/x$), etc.
A3. EQUATIONS AND INEQUALITIES	
3.14 use of discriminant, e.g. shows nature of roots	• Explain why there are no real solutions to a quadratic equation

3.15 finding quadratic equations using sum and product of roots 3.16 finding quadratic equations from its graph 3.17 solution of two equations, e.g. where they meet 3.18 formulating an equation to solve problems 3.19 quadratic optimizations	$ax^2 + bx + c = 0$ when $b^2 - 4ac$ is negative. • Compare and discuss nature of roots. • Use of optimization in real-life.
A4. SEQUENCE AND SERIES	
4.1 Developing, and justifying or proving, general rules/ formulae for sequences • Arithmetic sequence • Geometric sequence 4.2 Finding the sum of the series, including infinite series	• use tables to represent a repeating-pattern situation • generalize and explain patterns and relationships in words and numbers • write arithmetic/geometric expressions for particular terms in a sequence
A5. PROBLEMS IN REAL-LIFE CONTEXTS	
5.1 solving problems based on real-life contexts: • In everyday life (including population growth, decrease in price etc.) • Problem based on optimization, etc. 5.2 interpreting and analyzing data from tables and graphs 5.3 interpreting the solution in the context of the problem 5.4 identifying assumptions made and the limitations of the Solution	• Examine and make sense of data in a variety of contexts (including real data presented in graphs, tables and formulae/equations). • Work on tasks that incorporate some or all of the elements of the mathematical modelling process.
GEOMETRY AND TRIGONOMETRY	
G2. MENSURATION	
2.7 arc length as fraction of the circumference and sector area as fraction of the area of a circle 2.8 area of a segment 2.9 use of radian measure of acute (including conversion between radians and degree) 2.10 problems involving the arc length, sector area of a circle and area of a segment	• Find the arc length and sector area by considering them as fractions of the circumference and area of circle respectively. • Visualize the size of an angle of 1 radian and estimate the size of angles in radians.

G3. PYTHAGOREAN THEOREM AND TRIGONOMETRY	
3.4 use of the formula ½ for the area of triangle 3.5 introduction of all six T-ratios, e.g. sin, cos, tan, cot, sec and Cosec 3.6 solution of triangle using: • Sine rule • Cosine rule 3.7 trigonometric identities, e.g. $(\sin\theta)^2 + (\cos\theta)^2 = 1$, $\tan(x) = \sin(x)/\cos(x)$, etc. 3.8 introduction of unit circle	• Using the sine and cosine rules to solve problems. • Using trigonometric identities to prove/simplify simple T- expressions. • Finding the exact value of trigonometric functions of special angles. • Using radians to solve problems, where appropriate.
G5. COORDINATE GEOMETRY	
5.5 introduction of 3D geometry 5.6 use of following formulae: • Distance between two points • Midpoint 5.7 geometric problems involving the use of 3D coordinates	
G7. VECTORS IN TWO DIMENSIONS	
7.1 use of notations: $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$, $\lvert\overrightarrow{AB}\rvert$ and $\lvert\vec{a}\rvert$ 7.2 represented a vector as a directed line segment 7.3 translation by a vector 7.4 position vectors 7.5 magnitude of a vector 7.6 use of sum and difference of two vectors to express given vectors in terms of two coplanar vectors 7.7 multiplication of a vector by a scalar 7.8 dot product 7.9 geometric problems involving the use of vectors	• Represent graphically the sum and difference of two vectors, and a multiple of a vector. • Give examples to illustrate the resultant of two vectors. • Discuss properties of dot product.

G8. PROBLEMS IN REAL-LIFE CONTEXTS	
8.1 solving problems in real-life contexts using coordinates 8.2 interpreting the solution in the context of the problem 8.3 identifying the assumptions made and the limitations of the solution	• Work on tasks that incorporate some or all elements of the mathematical modelling process.
STATISTICS AND PROBABILITY	
S1. DATA ANALYSIS	
1.4 Quartiles and percentiles 1.5 Range, interquartile range and standard deviation as measure of spread for a set of data 1.6 Analysis and interpretation of: ▪ Box-and whisker plots ▪ Cumulative frequency diagrams 1.7 purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.8 calculation of the standard deviation for a set of data (grouped and ungrouped)	• compare the means and standard deviations of two sets of data • discuss examples of inappropriate representations of data from newspapers and other sources, e.g. whether certain representations are misleading. • Using GDC to calculate central tendencies, standard deviation, etc.
S2. PROBABILITY	
2.5 probability of simple combined events (including using possibility diagrams and tree diagrams, where appropriate) 2.6 addition and multiplication of probabilities (mutually exclusive events and independent events) 2.7 conditional probability 2.8 probability of successive trials 2.9 introduction of permutation and combination to calculate probabilities	• Discuss and differentiate between mutually exclusive and non-mutually exclusive events, and between independent and dependent events. • Calculating conditional probability