



سلطنة عمان

وزارة التربية والتعليم

الدرجة العامة للمدارس الخاصة

دائرة برامج ومناهج المدارس الخاصة

Applied Math Syllabus (2019-2020)

For Bilingual Program

Grades (11 – 12)

Based on:

1. Text Book:
Mathematics for the international student
Mathematical Studies (SL)
For use with IB Diploma Programme
2. Minimum student contact time (220 min/week)

GRADE 11

Semester 1

Area of maths covered	Topic	pages in book	Components of topic to be covered	No. of Weeks	Content
Number and Algebra	NUMBER SETS AND PROPERITES	17-34	<ul style="list-style-type: none"> • Some set language • Number Sets • Words used in Mathematics • Exponential (index) notation • Factors of natural numbers • Multiples of natural numbers • Order of operations 	1.5	<ul style="list-style-type: none"> • Natural numbers ; integers ; rational numbers ; and real numbers . • HCF • LCM • Using BEDMAS in ordering operations • Using calculator
Measurement	MEASUREMENT	35-66	<ul style="list-style-type: none"> • Time • Temperature • Imperial standard units • Standard form (scientific notation) • Rounding numbers • Rates • Measuring devices • Accuracy of measurements • Error and percentage error 	2	<ul style="list-style-type: none"> • Approximation: decimal places, significant figures. • Percentage errors. • Estimation. • Expressing numbers in the form $a \times 10^k$, where $1 \leq a < 10$ and k is an integer. • Operations with numbers in this form. • SI (Système International) and other basic units of measurement: for example, kilogram (kg), metre (m), second (s), litre (l), metre per second ($m s^{-1}$), Celsius scale. • Students should be able to convert between different units.
Sets	SETS AND VENN DIAGRAMS	67-84	<ul style="list-style-type: none"> • Set builder notation • Complements of sets • Venn diagram • Venn diagram regions • Numbers in regions 	1.5	<ul style="list-style-type: none"> - Basic concepts of set theory: elements $x \in A$, subsets $A \subset B$; intersection $A \cap B$; union $A \cup B$; complement A' . - Venn diagrams and simple applications.
Geometry	THE RULE OF PYTHAGORAS	85-108	<ul style="list-style-type: none"> • The rule of Pythagoras (review) • Pythagoras and geometrical figures • The converse of Pythagoras' rule • Problem solving • True bearings and navigation • Circle problems • Three-dimensional problems 	2	<ul style="list-style-type: none"> - Pythagoras rule and its converse. - Problems of chord of circle. - Tangent-Radius property problems. - 2D&3D problems

<p style="text-align: center;">Statistics</p>	<p style="text-align: center;">DESCRIPTIVE STATISTICS</p>	<p style="text-align: center;">109-164</p>	<ul style="list-style-type: none"> • Describing data • Presenting and interpreting data • Grouped discrete data • Continuous data • Frequency distribution tables • Summarizing the data • Measuring the spread of data • Box-and-whisker plots • The standard deviation • Statistics using technology • Parallel boxplots 	<p style="text-align: center;">3</p>	<ul style="list-style-type: none"> - Classification of data as discrete or continuous. - Simple discrete data: frequency tables. - Grouped discrete or continuous data: frequency tables; mid-interval values; upper and lower boundaries. - Frequency histograms. - Cumulative frequency tables for grouped discrete data and for grouped continuous data; cumulative frequency curves, median and quartiles. - Box-and-whisker diagram. - Measures of central tendency. - For simple discrete data: mean; median; mode. - For grouped discrete and continuous data: estimate of a mean; modal class. - Measures of dispersion: range, interquartile range, standard deviation.
<p style="text-align: center;">Algebra</p>	<p style="text-align: center;">LINEAR AND EXPONENTIAL ALGEBRA</p>	<p style="text-align: center;">165-202</p>	<ul style="list-style-type: none"> • Algebraic substitution • Linear equations • Fractional equations • Problem solving • Formula substitution • Formula rearrangement • Linear simultaneous equations • Problem solving • Index notation (Review) • Negative bases • Index laws • Exponential equations 	<p style="text-align: center;">3</p>	<ul style="list-style-type: none"> - Solve linear equations - Solve pairs of linear equations in two variables by : - Solve problems of pairs of linear equation. - Index and its laws. - Solving exponential equation

GRADE 11**Semester 2**

Area of maths covered	Topic	pages in book	Components of topic to be covered	No. of Weeks	Content
Geometry	COORDINATE GEOMETRY	203-234	<ul style="list-style-type: none"> • Distance between two points • Gradient • Applications of gradient • Midpoints • Vertical and horizontal lines • Equations of lines • Graphing lines • Midpoints and perpendicular bisectors 	3	<ul style="list-style-type: none"> - Equation of a line in two dimensions: the forms $y = mx + c$ and $ax + by + d = 0$. - Gradient; intercepts. - Points of intersection of lines. - Lines with gradients, m_1 and m_2. - Parallel lines $m_1 = m_2$. - Perpendicular lines, $m_1 \times m_2 = -1$. - The distance between two points; eg between two vertices or vertices with midpoints.
Algebra	QUADRATIC ALGEBRA	235-266	<ul style="list-style-type: none"> • Products and expansions • Further expansion • Factorization of quadratic expressions • Factorization of $ax^2 + bx + c$ ($a \neq 1$) • Quadratic equations • Completing the square • Problem solving with quadratics 	2.5	<ul style="list-style-type: none"> - Difference of Two squares & factorization - Perfect squares expansion & factorization - Expansion of $(a + b)^3$ - Removal of common factors - Quadratic trinomial factorization - Miscellaneous factorization - Factorisation by splitting the x-Term - The quadratic formula

Measurement	Trigonometric	Functions
PERIMETER, AREA AND VOLUME	NUMERICAL TRIGONOMETRY	FUNCTION NOTATION AND QUADRATIC FUNCTIONS
355-394	317-354	267-316
<ul style="list-style-type: none"> • Conversion of units • Perimeter • Area • Problem solving with areas • Surface area • Volume • Capacity • Density • Harder applications 	<ul style="list-style-type: none"> • Right angled triangle trigonometry • The trigonometric ratios • Trigonometric problem solving • Constructing trigonometric formulae • 3-dimensional problem solving • Areas of triangles • The cosine rule • The sine rule 	<ul style="list-style-type: none"> • Relations and functions • Interval notation, domain and range • Function notation • Functions as mappings • Linear functions • Quadratic functions • Graphs of quadratic functions • Axes intercepts • Graphs from axes intercepts • Axis of symmetry and vertex • Where functions meet • Quadratic modeling
2.5	3	3
<ul style="list-style-type: none"> - Geometry of three-dimensional solids: cuboid; right prism; right pyramid; right cone; cylinder; sphere; hemisphere; and combinations of these solids. - The size of an angle between two lines or between a line and a plane. - Volume and surface areas of the three-dimensional solids 	<ul style="list-style-type: none"> - Use of sine, cosine and tangent ratios to find the sides and angles of right-angled triangles. - Angles of elevation and depression. - Use of the sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ - Use of the cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$; $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ - Use of area of a triangle $= \frac{1}{2} ab \sin C$ - Construction of labelled diagrams from verbal statements 	<ul style="list-style-type: none"> - Concept of a function, domain, range and graph. - Function notation, eg $f(x)$, $v(t)$, $C(n)$. - Concept of a function as a mathematical model. - Linear models. - Linear functions and their graphs, $f(x) = mx + c$. - Quadratic models. - Quadratic functions and their graphs (parabolas): $f(x) = ax^2 + bx + c$; $a \neq 0$ - Properties of a parabola: symmetry; vertex; intercepts on the x-axis and y-axis. - Equation of the axis of symmetry, $x = -\frac{b}{2a}$

GRADE 12**Semester 1**

Area of maths covered	Topic	pages in book	Components of topic to be covered	No. of Weeks	Content
Number and Algebra	SEQUENCE AND SERIES	395-420	<ul style="list-style-type: none"> • Number Patterns • Sequences of numbers • Arithmetic sequences. • Geometric sequences. • Compound interest. • Growth and decay. • Series. 	2.5	<ul style="list-style-type: none"> - Arithmetic sequences and series, and their applications. - Use of the formulae for the nth term and the sum of the first n terms of the sequence. - Geometric sequences and series. - Use of the formulae for the nth term and the sum of the first n terms of the sequence.
Financial	FINANCIAL MATHEMATICS	421-452	<ul style="list-style-type: none"> • Foreign exchange. • Simple interest. • Compound interest. • Depreciation. • Personal loans. • The effect of inflation. 	4	<ul style="list-style-type: none"> - Currency conversions. - Students should be able to perform currency transactions involving commission. - Financial applications of geometric sequences and series: <ul style="list-style-type: none"> • compound interest • annual depreciation.
Probability	PROBABILITY	453-494	<ul style="list-style-type: none"> • Experimental probability. • Chance investigation. • Estimating probabilities from data. • Sample space. • Theoretical probability. • Using grids to find probabilities. • Compound events. • Using tree diagrams. • Sampling with and without replacement. • Probabilities from Venn diagrams. • Laws of probability. • Independent events revisited. 	4	<ul style="list-style-type: none"> - Sample space; event A; complementary event, A'. - Probability of an event. - Probability of a complementary event. - Expected value. - Probability of combined events, mutually exclusive events, independent events. - Use of tree diagrams, Venn diagrams, sample space diagrams and tables of outcomes. - Probability using "with replacement" and "without replacement". - Conditional probability.

<p style="text-align: center;">Logic</p>	<p style="text-align: center;">LOGIC</p>	<p style="text-align: center;">495-519</p>	<ul style="list-style-type: none"> • Propositions. • Compound propositions. • Truth tables and logical equivalence. • Truth tables for three propositions. • Implication. • Converse, inverse and contrapositive. • Valid arguments. • Arguments with three propositions. 	<p style="text-align: center;">2.5</p>	<ul style="list-style-type: none"> - Basic concepts of symbolic logic: definition of a proposition; symbolic notation of propositions. - Compound statements: implication, \Rightarrow ; equivalence, \Leftrightarrow ; negation, \neg ; conjunction, \wedge ; disjunction, \vee ; exclusive disjunction, \vee . - Translation between verbal statements and symbolic form. - Truth tables: concepts of logical contradiction and tautology. - Converse, inverse, contrapositive. - Logical equivalence. - Testing the validity of simple arguments through the use of truth tables.
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GRADE 12
Semester 2

Area of maths covered	Topic	pages in book	Components of topic to be covered	No. of Weeks	Content
Functions	EXPONENTIAL AND TRIGONOMETRIC FUNCTIONS	517-544	<ul style="list-style-type: none"> • Evaluating exponential functions. • Graphing simple exponential functions. • Exponential growth. • Exponential decay. • Period functions. • Sine functions. • Cosine functions. • Modeling using sine and cosine functions. • Equations involving sine and cosine. • Using sine and cosine models. 	4	<ul style="list-style-type: none"> - Exponential models. - Exponential functions and their graphs: $f(x) = ka^x + c; a \in \mathbb{Q}^+, a \neq 1, k \neq 0$. $f(x) = ka^{-x} + c; a \in \mathbb{Q}^+, a \neq 1, k \neq 0$. - Concept and equation of a horizontal asymptote.
	MORE FUNCTIONS	545-570	<ul style="list-style-type: none"> • Cubic polynomials. • Quartic polynomials. • The rectangular hyperbola. • Higher order rational functions. • Unfamiliar functions. • Where functions meet. 	3	<ul style="list-style-type: none"> - Models using functions of the form : $f(x) = ax^m + bx^n + \dots; m, n \in \mathbb{Z}$. - Functions of this type and their graphs. - The y-axis as a vertical asymptote. - Drawing accurate graphs. - Creating a sketch from information given. - Transferring a graph from GDC to paper. - Reading, interpreting and making predictions using graphs. - Included all the functions above and additions and subtractions. - Use of a GDC to solve equations involving combinations of the functions above.

<p style="text-align: center;">Statistics</p>	<p style="text-align: center;">TWO VARIABLE STATISTICS</p>	<p style="text-align: center;">571-600</p>	<ul style="list-style-type: none"> • Correlation. • Measuring correlation. • Least squares regression. • The χ^2 test of independence. 	<p style="text-align: center;">2.5</p>	<ul style="list-style-type: none"> - Bivariate data: the concept of correlation. - Scatter diagrams: line of best fit, by eye, passing through the mean point. - Pearson's product-moment correlation coefficient, r. - Interpretation of positive, zero and negative, strong or weak correlations. - The regression line for y on x. - Use of the regression line for prediction purposes. - The χ^2 test for independence: formulation of null and alternative hypotheses; significance levels; contingency tables; expected frequencies; degrees of freedom; p-values.
<p style="text-align: center;">Calculus</p>	<p style="text-align: center;">INTRODUCTORY DIFFERENTIAL CALCULUS</p>	<p style="text-align: center;">601-638</p>	<ul style="list-style-type: none"> • Rate of change. • Derivatives. • The idea of a limit. • The derivative function. • Simple rules of differentiation. • Tangents to curves. • The second derivative. • Changing shape. • Stationary points. • Rates of change. • Optimisation. 	<p style="text-align: center;">4.5</p>	<ul style="list-style-type: none"> - Concept of the derivative as a rate of change. - Tangent to a curve. - The principle that $f(x) = ax^2 \Rightarrow f'(x) = 2ax^{2-1}$. - The derivative of functions of the form $f(x) = ax^n + bx^{n-1} + \dots$, where all exponents are integers. - Gradients of curves for given values of x. - Values of x where $f'(x)$ is given. - Equation of the tangent at a given point. - Equation of the line perpendicular to the tangent at a given point (normal). - Increasing and decreasing functions. - Graphical interpretation of $f'(x) > 0$, $f'(x) = 0$ and $f'(x) < 0$. - Values of x where the gradient of a curve is zero. - Solution of $f'(x) = 0$. - Stationary points. - Local maximum and minimum points. - Optimization problems.