



Curriculum Map for Mathematics SL (DP1)

Unit Title (Time frame)	Standards	IB Objectives	Knowledge/Content	Skills	Assessments	Key resources
Topic 1 Algebra (8 teaching hours or 2 weeks)	Aero_Std_1: Make sense of problems and persevere in solving them. Aero_Std_2: Reason abstractly and quantitatively.	IB_Obj_1: Knowledge and understanding: recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. IB_Obj_2: Problem-solving: recall, select and use their knowledge of mathematical skills, results and models in both real and abstract contexts to solve problems.	1.1 Arithmetic and geometric sequences and series, sigma notation, applications 1.2 Laws of Exponents and logarithms, change of base 1.3 The binomial theorem expansion, calculation of binomial coefficients using Pascal's triangle and $\binom{n}{r}$	Students will be able to find the general term of an arithmetic (Or geometric) sequence, to calculate the sums of series and also to expand expressions using the binomial theorem and Pascal Triangle.	Formative: Direct questioning in class, observation during class discussion, classwork and homework. Summative: Test 1 (Objectives 1 and 2): Calculator free, for a duration of 1 hour. The test will cover the 3 topics in the unit.	Mathematics HL (Core) Third Edition Mathematics higher level Course Companion, Oxford
Topic 2: Functions and equations (8 teaching hours or 2 weeks)	Aero_Std_7: Look for and make use of structure. Aero_Std_6: Attend to precision.	IB_Obj_1: Knowledge and understanding: recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. IB_Obj_4: Technology: Use technology, accurately, appropriately and efficiently both to explore new ideas and to solve problems.	2.1 Concepts of functions: domain, range, image, composite, identity and inverse functions 2.2 Graph of a function and its equation, function graphing skills, investigation of key features of graphs: maximum and minimum values, intercepts, horizontal and vertical asymptotes, symmetry, domain and range 2.3 Transformations of graphs: translation, reflection in both axes, stretch, composite transformations. 2.4 The quadratic function, its graph, y-intercept, axis of symmetry, intercept and vertex forms	Students will know how to find the domain, range, and other features of a function (Maximum, minimum, intercepts...) They will be able to find the composite, inverse, and reciprocal of a function. They will also know how to solve linear, quadratic, exponential and logarithmic equations algebraically and graphically. Finally, they will know how to perform transformations on functions	Formative: Direct questioning in class, observation during class discussion, classwork and homework. Summative Test 2 (Objectives 1 and 4): is with a calculator.	Mathematics HL (Core) Third Edition Mathematics higher level Course Companion, Oxford



			<p>2.5 The reciprocal function $1/x$, its graph and self-inverse nature, the rational function $(ax + b)/(cx + d)$ and its graph, vertical and horizontal asymptotes</p> <p>2.6 Exponential and logarithmic functions and their graphs and relationships</p> <p>2.7 Solving equations, both graphically and analytically, use of technology to solve a variety of equations, solving quadratic equations using the quadratic formula, the discriminant and the nature of roots, solving exponential equations</p> <p>2.8 Applications of graphing skills and solving equations that relate to real-life situations</p>			
<p>Topic 3 Circular functions and trigonometry (12 teaching hours or 3 weeks)</p>	<p>Aero_Std_1: Make sense of problems and persevere in solving them.</p> <p>Aero_Std_8: Look for and express regularity in repeated reasoning.</p>	<p>IB_Obj_5: Reasoning: construct mathematical arguments through use of precise statements, logical deduction and inference, and by the manipulation of mathematical expressions.</p> <p>IB_Obj_1: Knowledge and understanding: Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.</p>	<p>3.1 The circle: radian measures of angles, length of arc, area of sector</p> <p>3.2 Definition of $\cos \theta$, $\sin \theta$ in terms of the unit circle, and $\tan \theta$ as $\sin \theta / \cos \theta$, exact values of trigonometric ratios of $0, \pi/6, \pi/4, \pi/3, \pi/2$ and their multiples</p> <p>3.3 The Pythagorean identity $\cos^2 \theta + \sin^2 \theta = 1$, double angle identities for sine and cosine, relationship</p>	<p>Students will know how to calculate the arc length and find the area of a given sector. They will also know how to simplify trigonometric expressions, solve (Algebraically and graphically) trigonometric equations, and graph trigonometric equations.</p>	<p>Formative: Direct questioning in class, observation during class discussion or board work, classwork, homework</p> <p>Summative Test 3 (Objectives 1 and 5): is calculator free and is one hour long.</p>	<p>Mathematics HL (Core) Third Edition</p> <p>Mathematics higher level Course Companion, Oxford</p>



			<p>between trigonometric ratios</p> <p>3.4 The circular functions $\sin x$, $\cos x$ and $\tan x$, their domains and ranges; amplitude, periodic nature, graphs, composite functions, transformations and applications</p> <p>3.5 Solving trigonometric equations in a finite interval, both graphically and analytically, quadratic equations in $\sin x$, $\cos x$ or $\tan x$</p> <p>3.6 Solution of triangles, cosine rule, sine rule, area of triangle $\frac{1}{2} ab \sin C$, applications</p>			
<p>Topic 5 Statistics and Probability</p> <p>(16 teaching hours or 4 weeks)</p>	<p>Aero_Std_1: Make sense of problems and persevere in solving them.</p> <p>Aero_Std_5: Use appropriate tools strategically</p>	<p>IB_Obj_1 Knowledge and understanding: recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.</p> <p>IB_Obj_4: Technology: use technology, accurately, appropriately and efficiently both to explore new ideas and to solve problems.</p>	<p>5.5 Concept of trial, outcome, equally likely outcomes, sample space and event, the probability of a event, complementary events, use of Venn diagrams, tree diagrams and tables of outcomes</p> <p>5.6 Combined events, mutually exclusive events, conditional probability, independent events, probabilities with and without replacement</p> <p>5.1 Concepts of population, sample, random sample, discrete and continuous data, presentation of data:</p>	<p>Students will know how to find probability for simple and combined events. They will be able to represent discrete and continuous data and also measure the central tendency of given data. Finally, they will learn how to solve problems related to Binomial and Normal distributions.</p>	<p>Formative: Direct questioning in class, classwork, homework</p> <p>Summative Test 4 (Objective 4): Probability is calculator free; test 5 (Objective 4): Statistics is with a calculator. Both tests are 1 hour each</p> <p>Test 5 (Objectives 3 and 4): Random variable is with a calculator</p>	<p>Mathematics HL (Core) Third Edition,</p> <p>Mathematics higher level Course Companion, Oxford</p> <p>IB Maths, Cambridge</p>



			<p>frequency distributions (tables), frequency histograms with equal class intervals, box and whisker plots, outliers, grouped data: use of mid-interval values for calculations, interval width, upper and lower interval boundaries, modal class</p> <p>5.2 Statistical measures and their interpretations central tendency: mean, median, mode, quartiles, percentiles, dispersion: range, interquartile range, variance, standard deviation, effect of constant changes to the original data, applications</p> <p>5.3 Cumulative frequency, cumulative frequency graphs, use to find median, quartiles, percentiles</p> <p>5.7 Concept of discrete random variables and their probability distributions, expected value (mean), $E(X)$ for discrete data, applications.</p> <p>5.8 Binomial distribution, its mean and variance</p> <p>5.9 Normal distribution and curves, standardization of normal variables (z-values, z-scores), properties of normal distribution</p>			
<p>Topic 6 Calculus (16 teaching hours or 4</p>	<p>Aero_Std_2: Reason abstractly and quantitatively.</p>	<p>IB_Obj_6: Inquiry approaches: investigate</p>	<p>6.1 Informal ideas of limit and convergence, limit</p>	<p>Student will learn how to find: The derivative rules, the equation of a</p>	<p>Formative: Direct questioning in class, classwork, homework</p>	



weeks)		unfamiliar situations, both abstract and real-world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.	<p>notation, definition of derivative from first principles, derivative interpreted as gradient function and as rate of change, tangent and normal and their applications</p> <p>6.2 Derivative of x^n, $\sin x$, $\cos x$, $\tan x$, e^x and $\ln x$, differentiation of sum and a real multiples of these functions, chain rule for composite functions, product and quotient rules, second derivative, extension to higher derivatives</p> <p>6.3 Local maximum and minimum points, testing for maximum and minimum, points of inflexion with zero and non-zero gradients, graphical behavior of functions, including the relationship between the graph of f, f' and f'', optimization, applications</p> <p>6.4 Indefinite integration as anti-differentiation, indefinite integral of x^n, $\sin x$, $\cos x$ and e^x, the composite of any of these with the linear function $ax + b$, integration by inspection, or substitution of the form</p> $\int f(g(x))g'(x) dx$ <p>6.5 Anti-differentiation</p>	tangent or a normal to a curve at a given point, the maximum and minimum of a given curve, points of inflection, optimization, integration rules, applications of differentiation and integration.	Summative Test 6 (Objective 2): (Derivative) is calculator allowed and test 7 (Objective 6): (Integration) is calculator free Both tests are 1 hour each	
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			<p>with a boundary condition to determine the constant term, definite integrals, both analytically and using technology, areas under curves (between the curve and the x-axis), areas between curves, volume of revolution about the x-axis</p> <p>6.6 Kinematic problems involving displacement, velocity and acceleration, total distance traveled</p>			
<p>Internal assessment (12 teaching hours or 3</p>	<p>Aero_Std_3: Aero_Std_3: Construct viable arguments and critique the reasoning of others.</p> <p>Aero_Std_2: Reason abstractly and quantitatively</p>	<p>IB_Obj_5: Reasoning: construct mathematical arguments through use of precise statements, logical deduction and inference, and by the manipulation of mathematical expressions.</p> <p>IB_Obj_3: Communication and interpretation: transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation.</p>	<p>Everything covered so far</p>	<p>All the skilled learnt can be used</p>		<p>Mathematics HL (Core) Third Edition Chapter 2 & 5</p>
		<p>IB_Obj_6: Inquiry approaches: investigate unfamiliar situations, both abstract and real-world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.</p>				<p>Mathematics HL (Core) Third Edition Chapter 1 & 6</p>



Curriculum Map for Mathematics Studies SL (DP2)

Unit Title (Time frame)	Standards	IB Objectives	Knowledge/Content	Skills	Assessments	Key resources
Set and Venn Diagram (4-hour teaching or 1 week)	Aero_Std_4	IB_Obj_2 IB_Obj_6	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 & simple applications.	Set operations; Use Venn diagram to organize information.		Mathematics Studies SL (third edition) Chapter 7
Logic (4-hour teaching + 1-hour test + 1-hour checking solution and summary. Therefore 6 hours in total or 1.5 weeks if 4 classes per week)	Aero_Std_3	IB_Obj_3 IB_Obj_5	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, $\underline{\vee}$. Translation between verbal statements and symbolic form. Truth tables: concepts of logical contradiction and tautology. Converse, inverse, contrapositive. Logical equivalence.	Convert verbal statements into logic propositions; Use logic principles and truth table to determine true or false on complex logic propositions.	Test 1 (1 hour test for both units)	Mathematics Studies SL (third edition) Chapter 8
Probability (6-hour teaching + 1-hour test + 1-hour checking solution and summary. Therefore 8 hours in total or 2 weeks if 4 classes per week)	Aero_Std_2	IB_Obj_2 IB_Obj_6	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.	Solving word problem by using approaches and symbol system of classical probability.	Test 2 (1 hour test)	Mathematics Studies SL (third edition) Chapter 9



<p>Normal Distribution</p> <p>(4 hours or 1 week)</p>	Aero_Std_5	IB_Obj_3 IB_Obj_4	<p>The normal distribution.</p> <p>The concept of a random variable; of the parameters μ and σ ; of the bell shape; the symmetry about $x = \mu$.</p> <p>Diagrammatic representation.</p> <p>Normal probability calculations.</p> <p>Expected value.</p> <p>Inverse normal calculations.</p>	<p>Solving word problems related to normal distribution.</p> <p>Using TI-84 to perform normal distribution and inverse normal calculation</p>		<p>Mathematics Studies SL (third edition)</p> <p>Chapter 10</p>
<p>Statistics of Two Variables</p> <p>(6 teaching hours + 1 hour test + 1 hour for checking solution and summary. Therefore 8 hours or 2 weeks in total)</p>	Aero_Std_5	IB_Obj_3 IB_Obj_4	<p>Bivariate data: the concept of correlation. Scatter diagrams; line of best fit, by eye, passing through the mean point.</p> <p>Pearson's product-moment correlation coefficient, r. Interpretation of positive, zero and negative, strong or weak correlations.</p> <p>The regression line for y on x. Use of the regression line for prediction purposes.</p> <p>The χ^2 test for independence: formulation of null and alternative hypotheses; significance levels; contingency tables; expected frequencies; degrees of freedom; p-values.</p>	<p>Handle bivariate data and do regression analysis by using calculator.</p> <p>Perform χ^2 test by using calculator</p>	<p>Test 3 (1 hour test for both units)</p>	<p>Mathematics Studies SL (third edition)</p> <p>Chapter 11</p>
<p>Introduction to differential calculus</p> <p>(14 teaching hours + 1 hour test + 1 hour for checking solution and summary. Therefore 14 hours in total or 4 weeks if 4 classes per week)</p>	Aero_Std_1	IB_Obj_1 IB_Obj_6	<p>Concept of the derivative as a rate of change. Tangent to a curve.</p> <p>The principle that $f(x) = ax^n \Rightarrow f'(x) = anx^{n-1}$.</p> <p>The derivative of functions of the form $f(x) = ax^n + bx^{n-1} + \dots$, where all exponents are integers.</p> <p>Gradients of curves for given values of x. Values of x where $f'(x)$ is given.</p> <p>Equation of the tangent at a given point.</p> <p>Equation of the line perpendicular to the tangent at a given point (normal).</p> <p>Increasing and decreasing functions. Graphical interpretation of $f'(x) > 0$, $f'(x) = 0$ and $f'(x) < 0$.</p> <p>Values of x where the gradient of a curve is zero. Solution of $f'(x) = 0$. Stationary points.</p> <p>Local maximum and minimum points.</p> <p>Optimization problems.</p>	<p>Using knowledge of differential calculus to write equation of tangent line and normal lines; solve optimization problems.</p>	<p>Test 4 (1 hour test)</p>	<p>Mathematics Studies SL (third edition)</p> <p>Chapter 20, 21</p>