

IB Mathematics SL Topics

1 Algebra	1.1	arithmetic sequences geometric sequences	sums of finite arithmetic sequences sums of infinite geometric series	sigma notation
	1.2	exponents logarithms	laws of exponents laws of logarithms	change of base
	1.3	the binomial theorem	expansion of $(a + b)^n$	Pascal's triangle
2 Functions and equations	2.1	the concept of function $f: x \mapsto f(x)$	domain, range composite functions	identity function inverse function f^{-1}
	2.2	the graph of a function its equation $y = f(x)$	function graphing skills use of graphing calculator	investigation of key features of graphs (incl. asymptotes) solving of equations graphically
	2.3	transformations of graphs: translations	stretches reflections	f^{-1} as reflection in $y = x$
	2.4	The reciprocal function $x \mapsto \frac{1}{x}$	its graph	its self-inverse nature
	2.5	the quadratic function $x \mapsto ax^2 + bx + c$ its graph	its y-intercept axis of symmetry $x = -\frac{b}{2a}$	the form $x \mapsto a(x - h)^2 + k$ with vertex (h, k) the form $x \mapsto a(x - p)(x - q)$ with x-intercepts $(p, 0)$ and $(q, 0)$
	2.6	the solution of $ax^2 + bx + c = 0$	the quadratic formula	use of the discriminant $\Delta = b^2 - 4ac$
	2.7	the exponential function $x \mapsto a^x$ with $a > 0$	its inverse function $x \mapsto \log_a x$ for $x > 0$	their graphs solution of $a^x = b$ using logarithms
	2.8	the exponential function $x \mapsto e^x$	the logarithmic function $x \mapsto \ln x$ for $x > 0$	
3 Circular functions & trig	3.1	the circle radian measure of angles	length of an arc	area of a sector
	3.2	definition of $\cos \theta$ and $\sin \theta$ in terms of the unit circle	$\tan \theta$ as $\frac{\sin \theta}{\cos \theta}$	the identity $\cos^2 \theta + \sin^2 \theta = 1$
	3.3	double angle formulae:	$\sin 2\theta = 2 \sin \theta \cos \theta$	$\cos 2\theta = \cos^2 \theta - \sin^2 \theta$
	3.4	the circular functions $\sin x$, $\cos x$, and $\tan x$ their domains and ranges	their periodic nature their graphs	composite functions of the form $f(x) = a \sin(b(x + c)) + d$
	3.5	solution of trigonometric equations in a finite interval	includes those of the type $a \sin(b(x + c)) = k$	quadratic equations in terms of trigonometric functions graphical interpretation
	3.6	solution of triangles the law of cosines	the law of sines	the area of a triangle as $\frac{1}{2}ab \sin C$
4 Matrices	4.1	definition of a matrix	the terms <i>element</i> , <i>row</i> , <i>column</i> , and <i>order</i>	
	4.2	algebra of matrices: equality addition, subtraction	multiplication by a scalar multiplication of matrices	identity matrices zero matrices
	4.3	determinant of a square matrix calculation of 2×2 and 3×3 determinants	inverse of a 2×2 matrix conditions for the inverse of a matrix	finding the inverse of a 3×3 matrix with a graphing calculator
	4.4	solution of systems of linear equations using inverse matrices	(maximum of three equations in three unknowns)	
5 Vectors	5.1	vectors as displacements in the plane vectors as displacements in three dimensions components of a vector column representation	$\mathbf{v} = \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = v_1 \mathbf{i} + v_2 \mathbf{j} + v_3 \mathbf{k}$ algebraic and geometric approaches to the sum and difference of vectors the zero vector	the vector $-\mathbf{v}$ multiplication by a scalar $k\mathbf{v}$ the magnitude of a vector $ \mathbf{v} $ unit vectors base vectors $\mathbf{i}, \mathbf{j}, \mathbf{k}$ position vectors $\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = \mathbf{b} - \mathbf{a}$

5 Vectors	5.2	parallel vectors the scalar product of two vectors	$\mathbf{v} \cdot \mathbf{w} = \mathbf{v} \mathbf{w} \cos \theta$ $= v_1w_1 + v_2w_2 + v_3w_3$	perpendicular vectors the angle between two vectors
	5.3	representation of a line as $\mathbf{r} = \mathbf{a} + t\mathbf{b}$	the angle between two lines	
	5.4	distinguishing between coincident and parallel lines	finding points where lines intersect	
6 Statistics and probability	6.1	concepts of population, sample, random sample	frequency distribution of discrete and continuous data	
	6.2	presentation of data as frequency tables presentation of data as diagrams	presentation of data as box and whisker plots grouped data mid-interval values	interval width upper and lower interval boundaries frequency histograms
	6.3	mean, median, mode quartiles, percentiles	range interquartile range	variance standard deviation
	6.4	cumulative frequency	cumulative frequency graphs	use to find median, quartiles, percentiles
	6.5	concepts of trial, outcome, equally likely outcomes sample space (U) and event	the probability of an event A as $P(A) = \frac{n(A)}{n(U)}$	the complementary events A and A' $P(A) + P(A') = 1$
	6.6	Combined events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	$P(A \cap B) = 0$ for mutually exclusive events
	6.7	conditional probability	definition $P(A B) = \frac{P(A \cap B)}{P(B)}$	independent events definition $P(A B) = P(A) = P(A B')$
	6.8	use of Venn diagrams	use of tree diagrams	use of tables of outcomes to solve problems
	6.9	concept of discrete random variables	their probability distributions	expected value (mean) $E(X)$ for discrete data
	6.10	binomial distribution	mean of the binomial distribution	
	6.11	normal distribution	properties of the normal distribution	standardization of normal variables
7 Calculus	7.1	informal ideas of limit and convergence derivatives of x^n , $\sin x$, $\cos x$, $\tan x$, e^x , and $\ln x$	definition of derivative as $f'(x) = \lim_{h \rightarrow 0} \left(\frac{f(x+h) - f(x)}{h} \right)$	derivative interpreted as gradient (slope) function derivative interpreted as rate of change
	7.2	differentiation of sums and real multiples of simpler functions	the chain rule for composite functions	the product and quotient rules the second derivative
	7.3	local maximum and minimum points	use of first and second derivative in optimization problems	
	7.4	indefinite integration as antidifferentiation	indefinite integrals of x^n , $\sin x$, $\cos x$, $\frac{1}{x}$, e^x	the composites of these with the linear function $ax + b$
	7.5	antidifferentiation with a boundary condition to determine the constant term	definite integrals	areas under and between curves volumes of revolution
	7.6	kinematics problems	displacement (s), velocity (v), and acceleration (a)	
	7.7	graphical behavior of functions: tangents and normals behavior for large $ x $ horizontal and vertical asymptotes	the significance of the second derivative distinction between maximum and minimum points	points of inflexion (inflection) with zero and non-zero gradients (slopes)