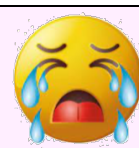
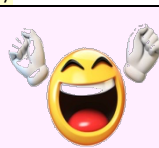


Analysis and Approaches Topic Checklist

Standard and Higher

Higher only

IB - A & A



Number and Algebra

Standard Form				
Arithmetic Series				
Geometric series (including sum of infinite geometric series)				
Sigma Notation				
Series applications (simple Interest, compound Interest, population growth/spread of disease)				
Indices rules – multiplication, division, negative powers and rational powers				
Solving logs and exponential equations (including hidden quadratics with exponentials)				
Logs – 5 rules (index, power, multiplication, division, change of base)				
Algebraic proofs				
Binomial expansion – integer powers				
Counting principles, permutations and combinations				
Binomial expansion – fractional and negative powers				
Partial fractions				
Complex numbers				
Proof by induction				
Proof by counterexample				
Proof by contradiction				
Solutions of systems of linear equations (max of 3 unknowns including unique, infinite or no solution)				

Functions

3 forms of a straight line				
Gradients and intercepts				
Midpoint and distances				
Straight Line Graphs – finding equations				
Parallel lines				
Perpendicular lines				
Functions – basic calculations including composite and types of functions (one to one, many to one)				
Domain and range				
Functions – inverse (calculating and using the fact that domain of inverse is range and range is domain, knowing when an inverse exists)				
Using a calculator to sketch and locate key features of graphs of functions (max, min, zeros, intercepts, vertex, asymptotes, intersection of 2 curves)				
Quadratics – graph, intercepts, axis of symmetry, vertex				
Quadratics – converting between 3 forms (factorised, vertex and standard)				
Quadratics – given graph form equation and vice versa				
Quadratics – solving including the quadratic formula (including hidden quadratics)				
Quadratics – discriminant				
Quadratics – solving inequalities				
Reciprocal function $\frac{1}{x}$ and its graph				
Rational functions $f(x) = \frac{ax+b}{cx+d}$ and their graphs (including equations of vertical and horizontal asymptotes)				
Exponential and logarithmic graphs				
Solving graphically e.g. $e^x = \sin x, x^4 + 5x - 6 = 0$				
Transformations: $f(x) \rightarrow af(bx+c)+d$				
Polynomial functions – graphs and zeros				
Factor and remainder theorem				
Polynomial division				
Sum and products of roots of polynomial equations				
Rational functions $f(x) = \frac{ax+b}{cx^2+dx+e}$ or $f(x) = \frac{ax^2+bx+c}{dx+e}$ and their graphs (including equations of vertical, horizontal and slant asymptotes)				
Odd and even functions				
Periodic functions				
Solutions of inequalities both graphically and analytically e.g. solve $g(x) \geq f(x)$				
Graphs of transformations (modulus, reciprocal, translations, sums/differences, squares, inverse). For example, given the graph of $f(x)$ and then need to graph any of $ f(x) , f(x), \frac{1}{f(x)}, f(ax+b), [f(x)]^2, f^{-1}(x)$				
Solutions and modulus and inequalities				

Geometry and Trigonometry

The distance between two points in three- dimensional space, and their midpoint.				
Volume and surface area of 3D shapes – Pyramid, cone, sphere, hemisphere and combinations of these				
Size of an angle between two intersecting lines or between a line and a plane				
Sine, cosine, and tangent ratios using special triangles (SOHCAHTOA)				
Sine/cosine Rule (including ambiguous case of sine rule)				
Area of a triangle				
Bearings				
Angles of elevation and depression				
Radians				
Arc lengths and areas of sectors				

Finding trig values of multiple angles of special angles using the unit circle Exact values of trigonometric ratios of $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$ and their multiples.				
Given the value of one trig function, find another (relationship between ratios)				
Identities $\sin^2 x + \cos^2 x = 1$ and $\tan x = \frac{\sin x}{\cos x}$				
Double angle identity $\sin 2x = 2 \sin x \cos x$ $\cos 2x = \cos^2 x - \sin^2 x$				
Transformations of trig functions and their graphs				
Trig Modelling – Real life contexts such as height of a tide and motion of a ferris wheel. Also including given graph find equation and vice versa (involves finding period, amplitude, phase shift).				
Solving trig equations (including quadratics)				
Identities $1 + \tan^2 x = \sec^2 x$ and $1 + \cot^2 x = \operatorname{cosec}^2 x$				
Double angle identity $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$				
Compound angle identity $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$, $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ This includes turning $a \sin x \pm b \cos x$ or $a \cos x \pm b \sin x$ into $r \sin(\theta \pm \alpha)$ or $r \cos(\theta \pm \alpha)$ b forms				
Inverse Trig				
Relationship between trig functions (co-functions) $\sin(180^\circ - \theta) = \sin \theta$ $\cos(180^\circ - \theta) = -\cos \theta$ $\tan(180^\circ - \theta) = -\tan \theta$				
Identities and solving with reciprocal functions: $\sec x = \frac{1}{\cos x}$, $\operatorname{cosec} x = \frac{1}{\sin x}$, $\cot x = \frac{1}{\tan x}$				
Vector basics – Basic Form, properties, magnitude, unit vector, sums and differences, multiplication and zero vector, unit vectors, position and displacement vector, perpendicular and parallel vectors				
Vectors – angles between 2 vectors, 2 lines, 2 planes and a line and plane				
Vectors – parallel, skew and intersecting lines				
Vector equations in 2 and 3 dimensions (vector equation of a line, cartesian equation of a line, parametric Form of a line, Equation of a plane, vector equation of a plane and cartesian equation of a plane)				
Vector products – scalar and cross product (including representation of area of a parallelogram)				
Vector intersections - 2 lines, 2 planes and a line and a plane				

Statistics and Probability

Concepts of population, sample, random sample, discrete and continuous data.				
Sampling technique - Simple random, convenience, systematic, quota and stratified sampling methods.				
Interpretation of outliers				
Presentation of data (discrete and continuous) – lists and grouped/ungrouped frequency distributions (tables).				
Histograms				
Cumulative frequency; cumulative frequency graphs; use to find median, quartiles, percentiles, range and interquartile range (IQR).				
Box and whisker				
Measures of central tendency (mean, median and mode). Estimation of mean from grouped data				
Modal class				
Measures of dispersion (interquartile range, standard deviation and variance)				
Effect of constant changes on the original data.				
Quartiles of discrete data				
Scatter diagrams; lines of best fit, by eye, passing through the mean point.				
Linear correlation of bivariate data (Pearson's product-moment correlation coefficient and line of best fit)				
Find and use of the equation of the regression line for prediction purposes (reliability) Interpret the meaning of the parameters, a and b , in a linear regression $y = ax + b$				
Sample Space				
Venn diagram				
Tree diagram				
Two-way tables				
Addition formula				
Mutually exclusive events				
Independent events				
Conditional probability				
Concept of discrete random variables and their probability distributions. Expected value (mean), for discrete data. Applications such as fair game				
Binomial distribution (including mean and variance)				
Normal distribution (probability calculations and working backwards to find the value, mean or sd.				
Bayes Theorem				
Variance of a discrete random variable				
Continuous random variables and their probability density functions				
Mode and median of continuous random variables				
Mean, variance and standard deviation of both discrete and continuous random variables				
The effect of linear transformations of X				

Calculus

Concept of a limit				
Derivative interpreted as gradient function and as rate of change				
$y = x^n$ differentiation technique				
Increasing/Decreasing (including graphical representations)				
Equations of Tangents and Normals				
Composite functions differentiation techniques – chain rule $((f(x))^n, \ln f(x), e^{f(x)}, \sin f(x), \cos f(x))$				
Product and Quotient Rule				

Stationary/Turning points (max/min)				
Second derivative and using this to test for max/min				
Optimisation				
Convex/Concave				
Points of Inflection				
$f \leftrightarrow f' \leftrightarrow f''$ graphs				
Optimisation (profit, area, volume)				
Kinematics				
$\int x^n$ Integration technique				
Definite integrals				
Finding area under a curve and between two curves				
Composite functions integration techniques ($(f(x))^n, \ln f(x), e^{f(x)}, \sin f(x)$ etc)				
Integration by inspection/recognition/reverse chain rule				
Differentiation by 1 st principles				
Higher derivatives				
Evaluating limits using L'Hopitals or Maclaurins Series				
Implicit Differentiation				
Rates of Change/Related Rates				
Optimisation (including where max/min occurs at an endpoint)				
Derivatives of <ul style="list-style-type: none"> • $a^{f(x)}$, • $\tan f(x)$ • $\sec f(x)$ • $\operatorname{cosec} f(x)$ • $\cot f(x)$ • $\sin^{-1} f(x)$ • $\cos^{-1} f(x)$ • $\tan^{-1} f(x)$ 				
Harder integrals – Using the above functions including having to use partial fractions first and completing the square				
Integration by Parts				
Integration by Substitution				
Area about y axis				
Volume of revolution				
Differential Equations				
Euler's method				
Maclaurin's Series				