New

IB Mathematics

MTO Worksheet
Curriculum Table

Mathematics HL/SL : Analysis & Approaches

MAA HL/SL

THE SPECIAL PREPARATION

WITH **SAM'S ACADEMY**

HL/SL Analysis & Approaches Common Topics

TABLE OF CONTENTS

1. THE BINOMIAL THEOREM
AA1.1 Factorial notation, Permutation and Binomial Coefficient
AA1.2 Binomial expansions and the binomial theorem

2. FUNCTIONS
AA2.1 Sign diagrams
AA2.2 Rational functions
AA2.3 Inverse functions
AA2.4 Graphs of functions
AA2.5 Absolute value functions

3. EXPONENTIAL FUNCTIONS
AA3.1 Exponential functions
AA3.2 Exponential equations
AA3.3 Growth and decay
[REVIEW] Growth and Decay including Compound interest

4. LOGARITHMS
AA4.1 Logarithmic Definition
AA4.2 Laws of logarithms and The change of base rule
AA4.3 Solving exponential equations using logarithms
AA4.4 Logarithmic functions

5. TRIGONOMETRIC EQUATIONS AND IDENTITIES
AA5.1 Trigonometric identities
AA5.2 Double angle identities
AA5.3 Trigonometric equations

6. INTRODUCTION TO DIFFERENTIATION
AA6.1 Limits
AA6.2 Rates of change and Instantaneous rates of change
AA6.3 Differentiation from first principles

7. RULES OF DIFFERENTIATION

AA7.1 Simple rules of differentiation

AA7.2 The product rule and The quotient rule

AA7.3 The chain rule

AA7.4 Derivatives of exponential functions and logarithmic functions

AA7.5 Derivatives of trigonometric functions

8. PROPERTIES OF CURVES

AA8.1 Tangents and Normals

AA8.2 Increasing and decreasing, Stationary points, Shape and Inflection points (Understanding functions and their derivatives)

9. APPLICATIONS OF DIFFERENTIATION

AA9.1 Rates of change

AA9.2 Optimisation

10. INTRODUCTION TO INTEGRATION

AA10.1 Antidifferentiation, Approximating the area under a curve and The Riemann integral

AA10.2 The Fundamental Theorem of Calculus

11. TECHNIQUES FOR INTEGRATION

AA11.1 Rules for integration

AA11.2 Integrating $f(ax+b)$ and Integration by substitution

12. DEFINITE INTEGRALS

AA12.1 Definite integrals

AA12.2 The area above a curve and The area under a curve

AA12.3 The area between two functions

13. KINEMATICS

AA13.1 Displacement, Velocity and Acceleration

AA13.2 Speed

14. BIVARIATE STATISTICS

AA14.1 Association between numerical variables

AA14.2 Pearson's product-moment correlation coefficient

AA14.3 The coefficient of determination

AA14.4 Line of best fit, Least squares regression line and The regression line of x against y

15. DISCRETE RANDOM VARIABLES

AA15.1 Random variables, Discrete probability distributions, Expectation

AA15.2 The binomial distribution

AA15.3 Poisson distribution

16. THE NORMAL DISTRIBUTION

AA16.1 Definition of the normal distribution, Calculating probabilities and Quantiles

AA16.2 The standard normal distribution

Only HL Analysis and Approaches Topics

1. INTRODUCTION TO COMPLEX NUMBERS

AAHL 1.1 Complex numbers

AAHL 1.2 The sum of two squares factorisation

AAHL 1.3 Operations with complex numbers

AAHL 1.4 Equality of complex numbers

AAHL 1.5 Properties of complex conjugates

3. REAL POLYNOMIALS

AAHL Polynomials, Operations with polynomials, Zeros, roots, and factors

AAHL Polynomial equality

AAHL Polynomial division, The Remainder theorem and The Factor theorem

AAHL The Fundamental Theorem of Algebra

AAHL Sum and product of roots theorem

AAHL Graphing Polynomial functions, Polynomial equations, Cubic inequalities

4. FURTHER FUNCTIONS

AAHL Even and odd functions

AAHL The graph of $y=[f(x)]^2$

AAHL Absolute value functions

AAHL Rational functions

AAHL Partial fractions

7 COUNTING PRINCIPLE AND FURTHER BINOMIAL THEOREM

AAHL The product principle

AAHL The binomial theorem for $n\in Z^+$

AAHL The binomial theorem for $n\in Q$

8. REASONING AND PROOF

AAHL Logical connectives, Proof by deduction, Proof by equivalence and Proof by exhaustion

AAHL Disproof by counter example

AAHL Proof by contrapositive, Proof by contradiction: reductio ad absurdum

9. PROOF BY MATHEMATICAL INDUCTION

AAHL The process of induction

AAHL The principle of mathematical induction

10. LINEAR ALGEBRA

AAHL Systems of linear equations and Row operations
AAHL Solving 2×2 systems of linear equations
AAHL Solving 3×3 systems of linear equations

11. VECTORS

A Vectors and scalars
B Geometric operations with vectors
C Vectors in the plane
D The magnitude of a vector
E Operations with plane vectors
F Vectors in space
G Operations with vectors in space
H Vector algebra
I The vector between two points
J Parallelism
K The scalar product of two vectors
L The angle between two vectors
M Proof using vector geometry
N The vector product of two vectors

12. VECTOR APPLICATIONS

A Lines in 2 and 3 dimensions
B The angle between two lines
C Constant velocity problems
D The shortest distance from a point to a line
E Intersecting lines
F Relationships between lines
G Planes
H Angles in space
I Intersecting planes

13. COMPLEX NUMBERS

A The complex plane
B Modulus and argument
C Geometry in the complex plane
D Polar form

E Euler's form
F De Moivre's theorem
G Roots of complex numbers

14. LIMITS
A Limits
B The existence of limits
C Limits at infinity
D Trigonometric limits
E Continuity

16 INTRODUCTION TO DIFFERENTIAL CALCULUS
A Rates of change
B Instantaneous rates of change
C The gradient of a tangent
D The derivative function
E Differentiation from first principles
F Differentiability and continuity

17 RULES OF DIFFERENTIATION
[Review]Simple rules of differentiation, The product rule, The quotient rule and The chain rule
[Review] Derivatives of exponential functions and Derivatives of logarithmic functions
[Review] Derivatives of trigonometric functions
H Derivatives of inverse trigonometric functions
I Second and higher derivatives
J Implicit differentiation

18 PROPERTIES OF CURVES
[Review] Tangents and Normals
[Review] Increasing and decreasing
[Review] Stationary points, Shape, Inflection points and Understanding functions and their derivatives
L'Hôpital's rule

19 APPLICATIONS OF DIFFERENTIATION
A Rates of change, Optimisation and Related rates

21 TECHNIQUES FOR INTEGRATION

Rules for integration, Integrating $f(ax+b)$ and Integration by substitution
Partial fractions
Integration by parts

22 DEFINITE INTEGRALS
A Definite integrals
B Definite integrals involving substitution
C The area under a curve
D The area above a curve
E The area between two functions
F The area between a curve and the y-axis
G Solids of revolution
H Problem solving by integration
I Improper integrals

23 KINEMATICS
A Displacement
B Velocity
C Acceleration
D Speed

24 MACLAURIN SERIES
A Maclaurin series
B Convergence
C Composite functions
D Addition and subtraction
E Differentiation and integration
F Multiplication
G Division

25 DIFFERENTIAL EQUATIONS
A Differential equations
B Euler's method for numerical integration
C Differential equations of the form dx/dy=f(x)
D Separable differential equations
E Logistic growth
F Homogeneous differential equations dx/dy=f(y/x)
G The integrating factor method

H Maclaurin series developed from a differential equation

26 BIVARIATE STATISTICS
A Association between numerical variables
B Pearson's product-moment correlation coefficient
C Line of best fit by eye
D The least squares regression line
E The regression line of x against y

27 DISCRETE RANDOM VARIABLES
A Random variables
B Discrete probability distributions
C Expectation
D Variance and standard deviation
E Properties of aX+b
F The binomial distribution
G Using technology to find binomial probabilities
H The mean and standard deviation of a binomial distribution

28 CONTINUOUS RANDOM VARIABLES
A Probability density functions
B Measures of centre and spread
C The normal distribution
D Calculating normal probabilities
E The standard normal distribution
F Normal quantiles