

# Syllabus



## MATHEMATICAL KANGAROO COMPETITION

### ■ PRE-ECOLIER - 1 & 2 (GRADE- 1 & 2)

- Simple arithmetic operations with 1 digit and 2-digit numbers
- Distinguishing simple figures
- Time, clock. number of days in a week
- Number of months in a year

### ■ ECOLIER – 1 & 2 (GRADE- 3 & 4)

- Simple arithmetic operations with 1,2,3 and 4-digit numbers
- Recognizing geometric figures.
- A magic square with a sum of 15
- Time, clock. number of days in a week, number of months in a year
- Addition, subtraction, multiplication, division. intersection of sets
- Perimeter and area of a square, a rectangle

### ■ BENJAMIN- 1 & 2 (GRADE- 5 & 6)

- Addition, subtraction, multiplication, division.
- Magic squares
- Fractions and decimals.
- Clock, a calendar
- Perimeter of a polygon. area of a rectangle and a triangle
- Mathematical logic.
- Lines and rays on a surface
- A cube, a rectangular solid. Acute, right, and obtuse angles.

### ■ CADET – 1 & 2 (GRADE – 7 & 8)

- Operations on rational numbers
- Powers of natural numbers
- Angles: acute, right, and obtuse
- Equations, inequalities and systems of linear equations
- Area of a rectangle, a triangle and a circle
- Lines and rays on a surface
- Volume and surface area of geometric figures
- Supplementary angles, sum of angles in a triangle and in a quadrilateral
- Mathematical logic

### ■ JUNIOR – 1 & 2 (GRADE - 9 & 10)

- Operations on real numbers
- Functions, polynomials, equations, inequalities.
- Sequences of numbers
- Elements of combinatorics
- Synthetic & analytic plane geometry

### ■ STUDENT – 1 & 2 (GRADE – 11 & 12)

- Simple arithmetic operations with 1,2,3 and 4-digit numbers
- Operations on real numbers
- Functions, polynomials, equations, inequalities.
- Sequences of numbers
- Elements of combinatorics
- Synthetic & analytic plane geometry



# Syllabus

## SINGAPORE & ASIAN SCHOOLS MATH OLYMPIAD

### ■ GRADE 1 – 4 (PRIMARY 1 – 4)

- Arithmetic and Statistics
- Geometry and Mensuration
- Solving word problems using model method (or any other non-algebraic methods)
- Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and simple cryptarithms)

### ■ GRADE 5 – 6 (PRIMARY 5 – 6)

- Arithmetic and Statistics
- Geometry and Mensuration
- Solving word problems using model method (or any other methods including algebra)
- Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

### ■ GRADE – 7 (SECONDARY – 1)

- Arithmetic and Statistics
- Geometry, Graphs and Mensuration
- Statistics
- Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

### ■ GRADE – 8 (SECONDARY – 2)

- Arithmetic and Statistics
- Geometry, Graphs and Mensuration
- Pythagoras' Theorem, Statistics
- Solving word problems using model method (or any other methods including algebra)
- Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

### ■ GRADE 9 – 12 (SECONDARY 3 – 4, Junior College 1 – 2)

- Arithmetic and Statistics
- Geometry, Graphs and Mensuration
- Pythagoras' Theorem and Trigonometry
- Statistics and Probability
- Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

# Syllabus



## SINGAPORE MATH GLOBAL COMPETITION

### Lower Primary Level/Grades 1-4

#### ■ PRIMARY 1/GRADE 1

- Numbers up to 20
- Time
- Length
- Shapes
- Pictorial graph

#### ■ PRIMARY 2/GRADE 2

- Numbers up to 100
- Addition & subtraction within 100
- Money
- Time
- Length
- 2D Shape
- Picture graph

#### ■ PRIMARY 3/GRADE 3

- Numbers up to 1000
- Addition & Subtraction within 1000
- Multiplication and Division of 2,3,4,5 &10
- Length
- Mass
- Volume
- Money
- Fractions
- Time
- Picture Graphs 11. 2-D & 3-D Shapes
- Heuristics

#### ■ PRIMARY 3-4/GRADES 3-4

- Numbers up to 100 000
- Factors and Multiples
- 4 Operations of Whole Numbers within 100 000
- Fractions
- Decimals
- Time
- Area and Perimeter
- Angles
- Properties of Rectangles and Squares
- Line Symmetry
- Tables, Bar Graphs & Line Graphs
- Money
- Length, Mass and Volume
- Parallel and Perpendicular Lines
- Heuristics

### Upper Primary Level to Secondary Level/ Grades 5-11

#### ■ PRIMARY 5-6/GRADES 5-6

- Numbers up to 10 million
- 4 Operations of Whole Numbers within 10 million
- 4 Operations of Fractions, 4 Operations of Decimals
- Ratio
- Percentage
- Area and Perimeter of Composite Figures, Angles
- Properties of Triangles & Quadrilaterals
- Volume of Cube and Cuboid
- Rate and Speed
- Average
- Algebra
- Pie Graphs, Nets Solid Figures
- Heuristics

#### ■ SECONDARY 1-2 / GRADES 7-8

- 4 Operations of Numbers
- Ratio & Proportion, Percentage
- Rate & Speed
- Algebraic Expressions & Formulae
- Functions & Graphs
- Equations and Inequalities
- Angles, Triangles and Polygons
- Congruence and Similarity
- Pythagoras' Theorem
- Mensuration
- Data Analysis

#### ■ SECONDARY 3-4 / GRADES 9-10/11-12

- Numbers and Number Patterns
- Angles and Polygons
- Mensuration, Arc Length and Area of Sector
- Equations, Functions and Polynomials
- Inequalities, Indices and Surds
- Coordinate Geometry and Circles
- Pythagoras' Theorem, Further Trigonometry and Applications of Trigonometry
- Trigonometric Functions, Identities and Equations
- Congruence and Similarity, Area and Volume of Similar Figures and Solids
- Geometry and Properties of Circles
- Set Language and Notation
- Probability
- Statistical Data Analysis
- Vectors in Two Dimensions
- Binomial Theorem
- Matrices

# Syllabus



## DOKA (DEPTH OF KNOWLEDGE ASSESSMENT)

### ■ PAPER P (GRADE 1 & 2)

- Addition and Subtraction, Comparing
- Consecutive Numbers
- Distance Line and Intervals
- Length, Mass, Mixed Operations
- Model Drawing, Money
- Multiples and Grouping
- Number Line
- Time
- Transferring

### ■ PAPER Q (GRADE 3 & 4)

- Before and After
- Comparing
- Numbers and Pattern
- Distance Line and Intervals
- Fractions, Length, Making A List/ Table
- Mass, Mixed Operations
- Model Drawing
- Money
- Multiples and Grouping
- Time and Calendar
- Transferring
- Volume

### ■ PAPER R (GRADE 5 & 6)

- Average
- Area and Perimeter
- Before and After
- Comparing
- Numbers and Pattern
- Fractions
- Making A List/ Table
- Measures and Units
- Model Drawing
- Mixed Operations
- Percentages
- Ratios
- Speed
- Transferring

### ■ PAPER S (GRADE 7 & 8)

- Algebraic Expressions
- Circles
- Counting
- Linear Inequalities, Measures and Units
- Percentages, Plane and Solid Geometry
- Probability, Pythagoras' Theorem

- Ratios
- Rates and Proportions
- Quadratic Expressions and Factorisation
- Simultaneous Equations
- Transformations
- Volume

### ■ PAPER T (GRADE 9 & 10)

- Algebraic Expressions, Bearing
- Circle Theorems, Coordinate Geometry
- Indices and Rules
- Measures and Units
- Plane and Solid Geometry
- Probability
- Pythagoras' Theorem
- Rationalise the Denominator
- Quadratic Expressions and Factorisation
- Set and Venn Diagrams
- Ratios
- Rates and Proportions
- Simultaneous Equations
- Transformations
- Trigonometry and Rules
- Vector

### ■ PAPER U (GRADE 11 & 12)

- Algebraic Expressions, Bearing
- Circle Theorems
- Coordinate Geometry
- Indices and Rules
- Measures and Units
- Plane and Solid Geometry
- Probability, Pythagoras' Theorem
- Rationalise the Denominator
- Quadratic Expressions and Factorisation
- Set and Venn Diagrams
- Ratios, Rates and Proportions
- Simultaneous Equations
- Transformations
- Trigonometry and Rules
- Vector
- Differentiation and Integration
- Matrices and Multiplication
- Combination and Permutation



# Syllabus

## AMERICAN MATHEMATICS OLYMPIAD

### ■ GRADE 2

- Place values in the base-ten number system.
- Simple fractions such as halves, thirds, and quarters or fourths.
- Addition and subtraction and related multiplication and division problems involving numbers less than 100.
- Simple number patterns involving addition or subtraction.
- Measuring length, time, and money, and collecting data in real-world contexts.
- Relating numbers less than 100 to points on the number lines.
- Basic counting strategies and reasoning in the context of life-like stories.
- Recognize, count, and see connections among simple 2D shapes such as triangles and rectangles.
- Problem solving strategies in the above areas.

### ■ GRADE 3

- Place values and number sense in the base ten number system.
- Understanding and solving multiplication and division problems around 100.
- Understanding fractions as numbers and in context, including unit fractions.
- Solving word problems using a modeling approach.
- Measuring length, weight, liquid volume, time, and money.
- Interpreting data from a scaled picture or bar graph.
- Developing concepts of perimeter and area of plane figures.
- Pattern identification and extensions of numbers and shapes.

### ■ GRADE 4

- Understanding of numbers and operations in the base ten number system.
- Four arithmetical operations on multi-digit whole numbers.
- Building upon the understanding of whole-number addition and multiplication to include fractions.
- Understanding factors, multiples, and divisibility.
- Recognizing patterns in number sequences or shapes to solve problems.

- Properties of two-dimensional shapes, including lines and angles.
- Solving real-world problems involving time, money, distance, weight, and liquid volumes.
- Creating mathematical models to solve challenging word problems.

### ■ GRADE 5

- The base-ten place value system and operations with integers and decimals to hundredths.
- Use fractions and special percentages as numbers and make sense of their operations in real-world contexts.
- Make sense of number patterns and numerical expressions.
- Use measurements in real-world situations, represent and analyze data using visuals and descriptors such as average, minimum, maximum, median, mode.
- Areas of 2D shapes and volumes of 3D solids and the underlying concepts such as unit squares and unit cubes.
- Graph points, lines, and make sense of simple relations in the Cartesian Coordinate System.
- Counting strategies and chances in real-world contexts.
- Extensions and problem solving scenarios involving one or more of the above ideas.

### ■ GRADE 6

- Understanding the base-ten number system and its properties.
- Solving arithmetic problems involving whole numbers, fractions, mixed numbers, and decimals.
- Finding factors and multiples of a whole number; understanding prime factorization.
- Understanding data variability and distribution, including related quantitative measures.
- Linear algebraic expressions and inequalities.
- Counting strategies.
- Spatial visualization of 2D and 3D shapes; solving problems involving area, surface area, and volume.
- Extensions and integration of mathematical ideas in the above areas.

## ■ GRADE 7

- Number systems and their properties; arithmetic operations with rational numbers.
- Proportional relationships and their applications.
- Using and solving linear equations in real-world contexts.
- Operations involving numeric and algebraic expressions and linear equations.
- Construction and properties of geometric figures such as circles, triangles, rectangle, parallelograms, and trapezoids; solving problems involving angles, area, surface area, and volume.
- Counting strategies, number sequences.
- Understanding random sampling, inferences, and probability models.
- Extensions and integrations of the mathematical ideas mentioned above.

## ■ GRADE 8

- Number systems, irrational numbers, and the nature of place-value number systems.
- Radical expressions and powers with integer exponents.
- Number patterns, arithmetic sequences, algebraic expressions, linear equations, and linear functions.
- The processes and properties of similarity and congruence.
- The Pythagorean Theorem and its applications.
- Properties of 2D and 3D shapes such as triangles, quadrilaterals, cubes, cones, cylinders, and spheres.
- Counting strategies and their applications in approaching probability problems.
- Extensions and problem solving scenarios in the above areas.

## ■ GRADE 9

- Number systems including place-value systems other than ten; irrational numbers, radical expressions, and definitions of  $\pi$ ,  $e$ ,  $i$ , and complex numbers; prime numbers, GCD, LCM, and relatively prime numbers.
- Arithmetic and geometric sequences; linear functions, quadratic functions, exponential function, and their inverses; function graphs; function composition.
- Polynomial arithmetic, factorization, zeros of polynomials; rational expressions and radical expressions.
- Reasoning with equations and inequalities algebraically and geometrically.
- Representing and solving simple systems of equations using matrices; vectors and their operations.
- Properties of common 2D shapes such as triangles, quadrilaterals, and circles.
- Angles related to circles.
- Similarity, congruence and related processes and processes such as dilation, reflection, and rotations.

- The Pythagorean Theorem and its applications in connecting geometry and algebra in the Cartesian System.
- Counting strategies, conditional probability, data analysis, and modeling in real-world contexts.
- Extensions and problem solving scenarios involving one or more of the above ideas.

## ■ GRADE 10

- Real and complex number systems, vectors, and their representations.
- Expansion and factorization of algebraic expressions; solving word problems using algebra, percentages, rates, money, distance-speed-time relations.
- Exponential and logarithmic functions and their properties.
- Rational, irrational, complex number operations as well as prime factorization, GCD, LCM.
- Similarity and congruence of triangles, properties of angles in a circle.
- Graphs of linear, quadratic, and polynomial functions.
- Arithmetic and geometric sequences and the related processes.
- The Pythagorean Theorem and its extensions and applications with trigonometric functions.
- Counting strategies, probability of single events, multiple events, and conditional probability.
- Trigonometric functions, trigonometric identities, and their applications in real-world contexts.
- Extension and integration of mathematical ideas in the above areas.

## ■ GRADE 11 & 12

- Number systems including integers, rational numbers, real numbers, and complex numbers; rational exponents; vectors, and matrix quantities.
- Arithmetic operations on polynomials and rational expressions; solving linear and quadratic equations, inequalities, and systems of equations.
- Constructing, transforming, modeling, and graphing linear functions, quadratic functions, exponential functions, logarithm functions, rational functions, and trigonometric functions.
- Arithmetic and geometric sequences.
- Properties of triangles, rectangles, parallelograms, trapezoids, regular polygons, and circles.
- Properties and processes of perpendicular bisectors of segments and angle bisectors.
- Concepts of congruence, similarity, symmetry, and related geometry transformations such as translations, rotations, and reflection.
- Algebra and geometry connections in the Cartesian coordinate system.
- Counting techniques, independence, conditional probability, and rules of probability.
- Extensions and problem solving scenarios in the above areas.

# Syllabus



## VANDA International Science Competition

### ■ GRADE 3 - 4 (PRIMARY 3 - 4)

- Diversity of living and non-living things
- Diversity of Materials
- Cycles in plants and animals
- Cycles in matter and water
- Plant system
- Human system
- Solar system
- Interaction of forces
- Energy forms and uses

### ■ GRADE 5 - 6 (PRIMARY 5 - 6)

- Diversity of living and non-living things
- Diversity of Materials
- Cycles in plants and animals
- Cycles in matter and water
- Human system
- Cell system
- Electrical system
- Solar System
- Interaction of forces
- Interaction within the environment
- Energy forms and uses
- Energy conversion

### ■ GRADE 7 - 8 (SECONDARY 1 - 2)

- Exploring Diversity of Matter by their Physical Properties
- Exploring Diversity of Matter by its Chemical Composition
- Exploring Diversity of Matter Using Separation Techniques
- Understanding Diversity of Living Things
- Model of Cells – the Basic Units of Life
- Model of Matter- The Particulate Nature of Matter
- Model of Matter - Atoms and Molecules
- Ray Model of Light
- Transport System in Living Things
- Human Digestive System

- Human Sexual Reproductive System
- Electrical Systems
- Interactions through the application of forces  
Energy and Work Done
- Transfer of Sound Energy through Vibrations
- Effects of Heat & its Transmission
- Chemical Changes
- Interactions within Ecosystems

### ■ GRADE - 9 (SECONDARY 3)

- Experimental Chemistry
- The Particulate Nature of Matter
- Formulae, Stoichiometry and the Mole
- Electrolysis
- Energy from Chemicals
- Chemical Reactions
- Cells Structure and Organisation
- Movement of Substances
- Biological Molecules
- Nutrition in Humans
- Nutrition in Plants
- Transport in Flowering Plants
- Transport in Humans
- Respiration in Humans

### ■ GRADE - 10 & 11 (SECONDARY 4)

- Acids, Bases and Salts
- The Periodic Table
- Metals
- Air
- Organic Chemistry
- Excretion in Humans
- Homeostasis
- Co-ordination and Response in Humans
- Reproduction
- Cell Division
- Molecular Genetics
- Inheritance
- Organisms and their Environment



# Syllabus



## Design Thinking with robotics and Computational Thinking International Competition

### SYLLABUS

The syllabus of all grades will include all topics from previous grades. (e.g., Primary 5-6/Grades 5-6 syllabus includes topics from Primary 1-2/Grades 1-2 and Primary 3-4/Grades 3-4.)

#### ■ GRADES 1 - 2:

##### Preparatory Computational Thinking

- Pattern recognition
- Sequencing
- Loops
- Binary representation of numbers
- Making simple decisions with conditions like if-then-else statements
- Repeating instructions through loops like the while statements
- Using simple functions
- Principle of Algorithms and Abstraction

#### ■ GRADES 3 - 4:

##### Computational Thinking 1

- Debugging
- Conditionals
- Variables
- Functions

#### ■ GRADES 9 - 10:

##### Programming 2

- Data structure
- Modularity
- Analysis
- Divide and conquer: Search
- Divide and conquer: Sorting
- Principle of Decomposition and Patterns

#### ■ GRADES 5-6:

##### Computational Thinking 2

- For Loops
- While Loops
- Nesting code
- Sorting
- Searching

#### ■ GRADES 11 - 12:

##### Introduction to Algorithm Design 2

- Introduction to Binary Representation, Bitwise Operations, Bitmasking
- Linear Data Structures
- Tree Data Structures
- Greedy Algorithms
- Shortest Paths
- Amortized Analysis, Two-pointers Method, Disjoint Set Union-Find

#### ■ GRADES 7 - 8:

##### Programming 1

- Introduction to input and output, lists, Strings, and iteration
- Creating and accessing variables for storing and manipulating data





# Syllabus



## HIPPO ENGLISH OLYMPIAD

- Questions will be drawn from school plus syllabus from different standard curriculum of national and international level.
- Sample questions and the online exam can be taken from the official HIPPO website: <https://www.hippo-competition.org/eng/practice.html>

### ■ Examination Topics

Topic	A1	A2	B1	B2	C1	C2
Personal Details						
Family & Friends						
Hobbies & Leisure Activities						
Holidays						
Transport						
Weather						
Shopping						
Health & Exercise						
Education						
Work, Jobs & Careers						
Films, Media & Entertainment						
Books and Literature						
News, Lifestyles & Culture						
Environment						
Technology & Science						
Community and Society						
Law and Order						
Abstract topics						

**LEGEND:**  ARE TOPICS COVERED IN THE RESPECTIVE GRADE / CATEGORY