Able Enrichment Centre - Prep Level Curriculum

Unit 1: Number Systems

- Number Line
- Converting expanded form into standard form or vice versa.
- Define: Prime Number, Natural Number, Integer, Rational Number, Irrational Number, and Real Number.
- Explain Decimal Places, decimals with repeating patterns, and decimals with non-repeating patterns.
- Symbols and signs used in mathematics.
- Roman Numerals

Unit 2: Basic operations

- Tips for mental math, exercises, focus throughout entire level
- Math drills
- Addition – one number to one number, and carrying over.
- Subtraction – one number from one number and borrowing.
- Explain how the number line works, introducing positive and negative numbers which leads to addition, subtraction.
- Multiplication Table and multiplying numbers with more than one digit.
- Division
    - Long division with remainders and decimals
    - Divisibility rules
- Multiplication/division with integers
- Application of operations to word problems (problem solving)

Unit 3: Factorials, Factors, and Multiples

- Explain what factorials are and the procedure in getting the answer.
- Explain what factors and multiples are.
- How to prime factorize
- How to find the lowest common multiple (LCM) and greatest common factor (GCF)

Unit 4: Order of Operations

- Order of Operations (BEDMAS)
    - How to show work
    - Introduce Tables of Brackets – Parentheses, Square Brackets, Braces
- Exponents

Unit 5: Fractions

- Explain what a fraction is composed of – Numerator and Denominator.
- Show how to reduce fractions to their lowest terms.
- Converting Improper Fractions into Mix Fractions and vice versa. Convert to decimals as well
- Addition and Subtraction of Fractions.
- Multiplication and Division of Fractions – Finding the least common denominator (LCD).
- Reciprocal of Fractions.

Unit 6: Measurements

- English and Metric Units of measure.
- Converting between Units and Systems

Unit 7: Shapes and Simple Geometry

In this section, formulae tables will be given out for students to learn and memorize.

- identity types of shapes and their attributes
- One-Dimension – Line and Dot, length
- Two-Dimensions – Finding the Perimeter, Circumference and Area of a given shape
- Three-Dimensions – Finding Volume and Surface area of a given shape, define edges and faces

Unit 8: Simple Pattern Recognition

- Arithmetic patterns, shape patterns, etc.
- Trends of data

Unit 9: Introduction to Algebra

- single operations only: addition/subtraction/multiplication/division
- word problems

Able Enrichment Centre - Level 1 Curriculum

Unit 1: Number Systems

- Number Systems – Expanded form and standard form
- Integers – Number line, Introduction to positive and negative numbers.
- Prime Numbers – Show how to find prime numbers in a given range
- Definitions: Natural Number, Integer, Rational Number, Irrational Number, and Real Number.
- Definition of a factor – Prime factorization.
- Factorials – Explain what they are and the procedure in getting the answer.
- Introduce Tables of Brackets – Parentheses, Square Brackets, Braces
- Order of Operations – (BEDMAS)

Unit 2: Fractions

- Properties of fraction – Numerator and Denominator.
- Reduction of fractions to their lowest terms.
- Converting Improper Fractions into Mix Fractions and vice versa.
- Addition and Subtraction of Fractions.
- Multiplication and Division of Fractions – Finding the least common denominator
- Reciprocal of Fractions.

Unit 3: Exponents

- Introduction to Simple Exponents – Review what Base and Exponent are.
- Multiplying & Dividing Exponents with the Same Base.
- zero and negative exponents
- intro fractional exponents, square & cube roots

Unit 4: Introduction to Trigonometry

- Pythagoras triangle
- constructing triangles, deconstructing larger shapes into triangles

Unit 5: Introduction to Decimals

- Decimal Notation.
- Converting fractions into decimals and vice versa.
- Explain Decimal Places, decimals with repeating patterns, and decimals with non-repeating patterns.
- Rounding decimals.
- Addition, Subtraction, Multiplication and Division of Decimals.
- Converting decimals into percentages and vice versa.

Unit 6: Ratios

- Definition of Ratio.
- Discuss ratios expressed as fractions.

Unit 7: Introduction to Simple Algebra

- Multiply and Divide unknown terms with numbers.
- Adding & subtracting unknown terms.
- Cross-multiplication.
- Apply algebra to word problems.
- Algebra with fractions
- Word problems
- pattern recognition, derive algebraic equations

Unit 8: Shapes

- Angles, Properties, and terminology
- types of triangles and their properties
- 5+ sides
- sum of interior/exterior angles
- derive formulas for perimeters, area, volume, etc

Unit 9: Data Analysis and Graphs

- Definitions of Mean, Median, & Mode – How to find Mean, Median, and Mode.
- Graphs – Histogram, Stem-and-Leaf, Line Graph, Pie Chart, and Bar Chart, scatter plots, best fit lines.
- Describe how to illustrate graphs and charts.
- Deriving information from graphs & charts.
- Tie in to pattern recognition from Unit 7

Unit 10: Intro to Cartesian Plane

- coordinate system, quadrants, points (ordered pairs)
- creating lines and trends (no formulas) from points and tables
- calculate distance between points

Unit 11: Shape Transformations

- transpose, rotate, flip, (maybe scale?) of simple shapes on the axes
- multiple transformations

Able Enrichment Centre - Level 2 Curriculum

Unit 1

- Exponent, Square roots, Cube roots
- Ratios, percentages, decimals, averages
- The exponent rules, working with exponents
- Powers of Monomials
- Zero and Negative Exponents
- Binary Number System

Unit 2

- Like terms, Writing equations
- Using add/subtract/mult/div to solve equations
- Solving equations using more than one step
- Solving equations with fractions and decimals
- Distributive property
- Solving problems using equations.

Unit 3

- Polynomials
- Monomials, binomial, trinomial
- Adding polynomials
- Subtracting polynomials
- Multiplying monomials by monomials
- Dividing monomials by monomials
- Common factors and the GCF
- Multiplying a polynomial by a monomial
- Dividing polynomials by monomials
- Binomial products
- Factoring trinomials
- Products of polynomial

Unit 4

- Pythagorean Theorem - intermediate
- Congruent triangles, similar triangles
- Introduction to Trig: 30-60-90 and 45-45-90 triangles

Unit 5

- Data Analysis and Probability
- Probability Formula
- Independent Events

Unit 6

- General Problem Solving covering different topics
- inequalities
- word problems

Unit 7

- Simple Factoring eg: $x2 + x = x(x+1)$

Unit 8: Cartesian Graphing

- graph straight lines
- calculate slopes and intercepts

Able Enrichment Centre - Level 3 Curriculum

Unit 1: Polynomials and Factoring

- Review of operations with polynomials
- Factoring polynomials by taking out common factors, by FOIL
- Formulas for special cases like sums/differences of squares, perfect squares
- Solving polynomial equations by factoring and the zero product rule

Unit 2: Rational Expressions

- Simplifying rational expressions by factoring
- Multiplying/Dividing rational expressions
- Finding common denominator of 2 rational expressions
- Adding/subtracting 2 rational expressions
- Solving equations with rational expressions
- Solving problems by formulating rational expressions

Unit 3: Exponents and Radicals

- Review of exponents and laws of exponents
- Radicals as exponents
- Simplifying radicals
- Rationalizing denominators
- Operations with radicals
- Solving radical equations

Unit 4: Simple Analytic Geometry

- Ordered pairs and the coordinate plane
- Distance between points
- Midpoint and slope formulas
- Slope-intercept and standard equations of lines
- Parallel and perpendicular lines
- x and y intercepts
- Graphing lines
- calculate line intersections

Unit 5: Quadratic Equations and Functions

- Solving quadratic equations by factoring and taking roots
- Completing the square
- Quadratic formula: derivation and application
- Discriminant and the properties of solutions
- Graphing quadratic equations by finding vertex and intercepts

Unit 6: Systems of Equations

- Solution by graphing; both linear and non-linear systems
  Linear Systems:
- Consistent vs. inconsistent systems, number of possible solutions
- Solutions by substitution and add/subtract method
- 3 by 3 systems

Unit 7: Right Angle Trigonometry

- Solving problems with triangles
- Sine and cosine laws
- Similar triangles

Unit 8: Introduction to Unit Circle

- The Unit Circle
- 30/45/60/90 trig values
- radians
- solving for θ

Unit 9: Geometric Sequences

- Derive and apply expressions to represent general terms for geometric growth
- Solve problems involving finite geometric series
- Apply infinite geometric processes to solve problems

Able Enrichment Centre - Level 4 Curriculum

Unit 1: Trigonometry

- Distinguish between degree and radian measure, and solve problems, using both
- Describing the three primary trigonometric functions (sin θ, cos θ, tan θ), and their reciprocal (csc θ, sec θ, tan θ) as circular functions with reference to the unit circle and an angle in standard position
- Solve first and second degree trigonometric equations over specified domains
- Determine the exact values of trigonometric ratios for 0°,30°, 45°, 60°, and 90° as well as 0, $\frac{\pi}{6}$, $\frac{\pi}{4}$, $\frac{\pi}{3}$, $\frac{\pi}{2}$; expand into unit circle
- Solve first and second degree trigonometric equations over specified domains
- Determine the general solutions to trigonometric equations where the domain is the set of real numbers
- Draw, sketch and analyze the graphs of sine, cosine and tangent functions and their inverses of:
    a. domain and range
    b. amplitude
    c. period
    d. asymptotes
    e. intercepts
- Trigonometric Identities
- Analyze trigonometric identities graphically and verify them algebraically
- Use sum, difference and double angle identities for sine, cosine, and tangent to verify and simplify trigonometric expressions

Unit 2: Conics Sections and Graphing

- Define: conic sections
- Classify conic sections according to shape or according to a given equation in general or standard form
- Convert a given equation of a conic section from general to standard form and vice versa
- conic sections to be covered: lines, parabolas, circles, ellipses, hyperbolas
- Sketch and analyze the graphs of conic sections for:
    a. x and y intercepts
    b. domain and range
    c. asymptotes if any, and holes
    d. centre
    e. vertices
    f. axes of symmetry
    g. inequalities
- solve for intersections between conic sections
- derive conic equations given points and/or parameters

Unit 3: Transformations

- Describe how various translations of functions affect graphs and their related equations
  - y = f(x – h)
  - y – k = f(x) or y = f(x) + k
  - graph conics and polynomials with simple transformations, solve for asymptotes, vertices, intercepts, etc.
  - graph trig functions with simple transformations
- Describe how various stretches or compressions of functions affect graphs and their related equations:
  - y = af(x)
  - y = f(bx)
- Describe how reflections of functions of both axes and in the line y = x affect graphs and their related equations:
  - y = f(-x)
  - y = -f(x)
  - y = $f^{-1}(x)$
- Using the graph and/or the equation of f(x), describe and sketch 1/f(x)
- Using the graph and/or the equation of f(x), describe and sketch /f(x)/
- Describe and perform single transformations and combinations of transformations on functions and relations

Unit 4: Polynomial Graphing

- add/subtract/multiply/divide monomials, numerically and graphically
- roots and asymptotes and "holes"
- construction of a number line

Unit 5: Logarithms and Exponents

- Graph and analyze exponential functions
- Solve exponential equations having bases that are powers of one another
- Define logarithm and change exponential statements to equivalent logarithmic statements and vice versa
- Graph and analyze logarithmic functions
- Simplify and expand logarithmic expressions using the laws of logarithms
- Solve and verify the exponential and logarithmic equations
- Use the concept of base e in analyzing problems involving exponential and logarithmic functions
- Model and apply exponential and logarithmic functions

Permutations, Combinations and Binomial Theorem

- Use factorial notation and the fundamental counting principle for solving problems
- Determine the number of permutations of n different objects taken r at a time and use this to solve problems
- Determine the number of combinations of n different objects taken r at a time and use this to solve problems
- Solve problems, using the binomial theorem for $(a+b)^N$, where N belongs to the set of natural numbers

Probability

- Use factorial notation and the fundamental counting principle for solving problems
- Determine the number of permutations of n different objects taken r at a time and use this to solve problems
- Determine the number of combinations of n different objects taken r at a time and use this to solve problems
- Solve problems, using the binomial theorem for $(a+b)^N$, where N belongs to the set of natural numbers

Able Enrichment Centre - Level 5 Curriculum

Unit 1: Review

- Variable, first lesson designed to assess class aptitude toward pre-calculus mathematics.

Unit 2: Pre-Calculus

- Functions
- Limit of Functions
- Continuity
- Limits
    - To a specified point
    - To infinity (Horizontal and Vertical Asymptotes)
- Introduction to Definition of Derivatives

Unit 3: Differentiation

- Definition of Derivatives Continued
- Differentiation
    - Power Rule
    - Product Rule
    - Quotient Rule
    - Chain Rule
- Differentiation of Trigonometric Functions
- Differentiation of Logarithmic Functions
- Differentiation of Exponential Functions
- Implicit Differentiation
- Higher Order Derivatives

Unit 4: Application of Derivatives

- Max & Min Values
- Mean Value Theorem
- Monotonic Functions (First Derivative Test)
- Concavity and Inflexion Points
- Curve Sketching (see unit 5)
- Real world applications and examples

Unit 5: Polynomial graphing/Curve Sketching

- Construction of multiple number lines based on the derivatives (slopes, concavity, min/max points, inflection points)
- Sketch polynomial curves using additional information from the derivatives

Unit 6: Integration

- Theory behind integration and proof
- Basic Polynomial function integration
- Trigonometric function integration
- Integration by substitution
- Area under curve

Unit 7: Problem Solving

- Word Problems
- Related Rates