**Math Analysis and Approaches 2021 - 2022**

**Wylie Schwieder**

**e-mail:** [**wpschwieder@henrico.k12.va.us**](mailto:wpschwieder@henrico.k12.va.us)

**PRIOR KNOWLEDGE**

Number and algebra

* Number systems: natural numbers ℕ; integers, ℤ; rationals, ℚ, and irrationals; real numbers, ℝ
* SI (Système International) units for mass, time, length, area and volume and their derived units, eg. speed
* Rounding, decimal approximations and significant figures, including appreciation of errors
* Definition and elementary treatment of absolute value (modulus), *a*
* Use of addition, subtraction, multiplication and division using integers, decimals and fractions, including order of operations
* Prime numbers, factors (divisors) and multiples
* Greatest common factor (divisor) and least common multiples (HL only)
* Simple applications of ratio, percentage and proportion
* Manipulation of algebraic expressions, including factorization and expansion
* Rearranging formulae
* Calculating the numerical value of expressions by substitution
* Evaluating exponential expressions with simple positive exponents
* Evaluating exponential expressions with rational exponents (HL only)
* Use of inequalities, <,≤,>,≥, intervals on the real number line
* Simplification of simple expressions involving roots (surds or radicals)
* Rationalising the denominator (HL only)
* Expression of numbers in the form *a*×10*k*, 1≤*a*<10, *k*∈ℤ
* Familiarity with commonly accepted world currencies
* Solution of linear equations and inequalities
* Solution of quadratic equations and inequalities with rational coefficients (HL only)
* Solving systems of linear equations in two variables
* Concept and basic notation of sets. Operations on sets: union and intersection
* Addition and subtraction of algebraic fractions (HL only).

Functions

* Graphing linear and quadratic functions using technology
* Mappings of the elements of one set to another. Illustration by means of sets of ordered pairs, tables, diagrams and graphs.

Geometry and trigonometry

* Pythagoras’ theorem and its converse
* Mid-point of a line segment and the distance between two points in the Cartesian plane
* Geometric concepts: point, line, plane, angle
* Angle measurement in degrees, compass directions
* The triangle sum theorem
* Right-angle trigonometry, including simple applications for solving triangles
* Three-figure bearings
* Simple geometric transformations: translation, reflection, rotation, enlargement
* The circle, its centre and radius, area and circumference. The terms diameter, arc, sector, chord, tangent and segment
* Perimeter and area of plane figures. Properties of triangles and quadrilaterals, including parallelograms, rhombuses, rectangles, squares, kites and trapezoids; compound shapes
* Familiarity with three-dimensional shapes (prisms, pyramids, spheres, cylinders and cones)
* Volumes and surface areas of cuboids, prisms, cylinders, and compound three-dimensional shapes

Statistics and probability

* The collection of data and its representation in bar charts, pie charts, pictograms, and line graphs
* Obtaining simple statistics from discrete data, including mean, median, mode, range
* Calculating probabilities of simple events
* Venn diagrams for sorting data
* Tree diagrams

Calculus

* Speed = distance/time