



RATIONALE:

This course outline is the result of a four year project sponsored by the NCB Foundation. Through a partnership between St. George's College and key Mathematics educators, pilot schools were evaluated in order to define and produce a curriculum that would emphasize scope and sequencing of mathematical topics from first to fifth form. The topics in the outline are not taught in isolation but by linking with other topics and in a spiral approach across the grade levels and within grade levels.

This course outline is a simplification of that scope and sequence document and is intended to provide parents and students with a tool to assist the home in working along with the school, to improve student performance. Use it well!

NUMBER: NUMBER THEORY AND COMPUTATION

Topic

Sub Topics

1.0 Numbers, Symbols, Number Systems (Historical Reflection & Review)

1.1

- a) number:
 - a.i) idea, word, symbol;
 - a.ii) the many uses of numbers in everyday experiences: counting, measuring, ordering, labelling ...;
- b) the evolution and use of many number systems with special reference to:
 - b.i) the Roman System and its symbols;
 - b.ii) the Hindu - Arabic System, a *Place-value* System (*PVS*), and its symbols;
- c) special properties of the denary / base ten *PVS*;
- d) types/classification of numbers in the Hindu –Arabic system and their inter-relationships

2.0 Whole Numbers (Representation, Basic concepts and Operations)

2.1

- a) the Roman System:
 - a.i) use of the main symbols, (I,V,X,L,C,D,M) for representing the counting numbers;
 - a.ii) the subtractive principle e.g.V for five, and IV for *four*
- b) use of Roman Symbols in the environment; A & S operations as needed for investigations and problem-solving.

2.2

- a) use of the *base ten PVS* for:
 - a.i) sequential counting, ordering and comparison of numbers;
 - a.ii) identification, completion and creation of number patterns and sequences;
- b) the basic operations, A, S, M, D
 - b.i) singly;
 - b.ii) combined, noting the order of operations;

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Sub Topics

- c) application of the commutative, associative and distributive properties of numbers to aid efficient 'mental' and written computation;
- d) approximate values
 - d.i) to the nearest whole, 10, 100, 1000
 - d.ii) estimates of results by rounding to the nearest whole, 10, 100, 1000;
- e) problem-solving involving
 - e.i) establishment and use of a **basic 5-step plan**;
 - e.ii) translation from words to numerals and use of symbols, =, \neq , $>$, $<$, \geq , \leq ;
 - e.iii) interpretation of information given by tables/charts, bar graphs, pictograms;
 - e.iv) logical reasoning and choice of operation(s);
 - e.v) use of simple, clear statement(s)/reason(s) for choice at (iv) above;
 - e.vi) application of concepts and procedures, 2.2(a) – (e);
 - e.vii) use of appropriate labels and/or units of measure

2.3 a) formal application of the *place-value* concept to numbers in bases other than 10:

- a.i) the value of a digit in a numeral in any base;
- a.ii) conversion from base 10 to other bases and vice versa;

2.4

- a) understanding and use of:
 - a.i) *even* and *odd*, *consecutive even* and *odd* numbers;
 - a.ii) *directed numbers/integers*:
- b) representation on a
 - (b.i.1) number line
- c) comparison & ordering
- d) basic operations; addition and subtraction, multiplication and division with integers
- e) understanding and use of the concepts:

NUMBER: NUMBER THEORY AND COMPUTATION

Topic

Sub Topics

- e.i) *factor, prime factor,*
- e.ii) *prime and composite numbers,*
- e.iii) *numbers as products of their factors,*
- e.iv) *common factor, highest common factor (HCF),*
- e.v) *multiple, common multiple, least common multiple (LCM)*
- f) problem-solving using *HCF* and *LCM*
- g) indices
 - g.i) numbers expressed as factors in index form
 - e.g $72 = 2 \times 2 \times 2 \times 3 \times 3$
 $= 2^3 \times 3^2$
 - e.viii) evaluation of numbers with positive indices

3.0 Rational and Irrational Numbers

3.1

- a) the concept: ***common fraction***, and working with common fractions:
 - a.i) formation and use of equivalent fractions;
 - a.ii) comparison and ordering of fractions;
 - a.iii) operations (A.S, M, D) with common fractions and mixed numbers, actual & estimated results;
 - a.iv) combined operations with special attention to the order of operations;
 - a.v) expression of one quantity as a fraction of another;
 - a.vi) computation of the required fraction of a given number or quantity;
 - a.vii) computation of the whole or the total when given the value of a fraction of it;
- b) solution of word problems involving the use of common fractions and/or mixed numbers.

3.2 A *percent*, the concept, symbol and use:

- a) forming and comparing percentages;
- b) computation of a percentage of a number or quantity;
- c) expressing one number as a percentage of another;
- d) computation of the total when given a percentage of that total

NUMBER: NUMBER THEORY AND COMPUTATION

Topic

Sub Topics

3.3

- a) *the decimal fraction*: concept, notation and use:
 - a.i) relation between location and value of a digit in a number in the base ten *PVS*; special attention to digits which value 10^{th} , 100^{th} , or 1000^{th} of a unit;
 - a.ii) reading, writing, comparing and ordering of numbers which are in decimal form;
 - a.iii) the basic operations (A, S, M, D) with decimal fractions & mixed numbers including decimal currency
- b) finding approx. values by:
 - b.i) rounding decimal numbers to the nearest whole;
 - b.ii) giving decimal fractions and mixed numbers to one or two places of decimals

3.4 Relationships among the rational numbers at 3.1 – 3.3: conversion from

- a) common fractions to percents and vice versa;
- b) common fractions to decimal fractions and vice versa with or without the help of a calculator;
- c) decimal fractions to percents and vice versa;
- d) selection of the most appropriate type of rational number to be used in a given situation

NUMBER: NUMBER THEORY AND COMPUTATION

Topic

Sub Topics

4.0 Sets

4.1

- a) special concepts, language, symbols and notation associated with sets:
 - a.i) an element or a member;
 - a.ii) use of curly brackets/braces;
 - a.iii) use of capital letter to name a set;
 - a.iv) the cardinal number of a set;
 - a.v) belonging/not belonging to a set;
 - a.vi) the empty or null set;
 - a.vii) subset(s)
 - a.viii) the intersection and union of sets;
 - a.ix) disjoint sets.
- b) Venn diagrams:
 - b.i) their use to show single sets and/or the relationship between two sets;
 - b.ii) interpretation of information given by Venn diagrams showing one or two sets.

MEASUREMENT

Topic

Sub-topic

1.0 Introductory Concepts

1.1

- a) the S.I.(metric) system of units for measuring *length, area, mass, volume, capacity* and the link to:
 - a.i) the base 10 place-value system for reading and recording decimal numbers;
 - a.ii) the use of prefixes to indicate the relative sizes of measures;
- b) expression of one unit of measurement in terms of a larger or smaller unit;
- c) appropriate choice and use of measuring instrument and unit of measure for best results

2.0 Length

(Linear or one-dimensional measure)

2.1

- a) basic unit of length (m) and its relation to commonly used smaller & larger units, especially the mm, cm, km; conversion from one unit to another;
- b) choice of appropriate unit for the measurement of length, height and distance (actual or estimated);
- c) basic operations, A,S,M,D with linear measures;
- d) approximate measures:
 - d.i) to the nearest whole;
 - d.ii) to 1 or 2 decimal places
- e) problem-solving requiring the application of (a) – (d)

3.0 Perimeter

(Distance around the outside of a shape/region)

3.1

- a) perimeter of plane shapes (regular or irregular) bounded by straight lines, including
 - a.i) triangles
 - a.ii) quadrilaterals

MEASUREMENT

Topic

Sub-topic

- a.iii) pentagons where the lengths of the sides are given or may be readily calculated;
 - b) computation of
 - b.i) the length(s) of missing side(s) of a 3-5 sided shape when the perimeter of the shape is known;
 - c) approximation of values as listed at 2.1 (d);
 - d) solution of 'word' problems involving (a) – (c)
- 4.0 Area**
(Space covered by a shape or region)
- 4.1
- a) area of region covered by:
 - a.i) some plane shapes.... the *rectangle, square & triangle*, where lengths of sides are given or can be deduced;
 - a.ii) composite shapes: any combination of shapes named at (i);
 - b) use of appropriate square units
 - c) problem-solving involving area concepts and procedures already introduced.
- 5.0 Time**
- 5.1
- a) basic unit (hour) and the relation to
 - a.i) parts of the hour;
 - a.ii) other measures of time: day, week, month, year, leap year, decade, century
 - a.iii) use of *B.C.* and *A.D.*
 - b) time as represented:
 - b.i) on the 12-hour clock
 - b.ii) on the 24-hour clock
 - b.iii) in digital form - conversion from one type of representation to another; - use of *a.m.* and *p.m.*
 - c) estimation of and formal operations (A, S, M, D) with units of time; special attention to calculation of *time elapsed*
 - d) problem-solving involving the passing and use of time whether the information is given verbally or on tables or charts
- 6.0 Temperature**
- 6.1

MEASUREMENT

Topic

Sub-topic

- a) use of the Celsius scale;
 - a.i) notation for a unit of measure ($^{\circ}\text{C}$);
 - a.ii) use of the thermometer;
 - a.iii) temperatures at freezing and boiling points;
- b) relative heat and cold;
 - b.i) temperatures below zero;
 - b.ii) comparison of temperatures;
 - b.iii) other operations with measures of temperature
- c) problem-solving involving (a) – (b).

GEOMETRY AND TRIGONOMETRY

Topic

Sub-topic

1.0 Basic Geometric Concepts

1.1

- a) Geometry: investigation and measurement of the space in which we live / the shapes and structures that occupy the environment:
 - a.i) their patterns, forms, similarities and differences, normal/regular usage; familiar names given to objects/three-dimensional shapes and solids that are most often seen and/or used;
 - a.ii) informal methods of measuring their size, volume, mass, capacity;
- b) definition, representation and use of spatial terms with special attention to:
 - b.i) *point*; (a location in space);
 - b.ii) *line* (set of points), *line segment*, *end point*, *ray(s)*, *common end point*, *angle*, *vertex of angle*;
 - b.iii) *plane / flat surface*;

1.2

- a) lines in a plane... types:
 - a.i) *curved*, *straight*, *vertical*, *horizontal*;
 - a.ii) *parallel*, *intersecting*, *perpendicular*;
- b) line segments:

GEOMETRY AND TRIGONOMETRY

Topic

Sub-topic

- b.i) representing and naming;
- b.ii) measurement of a given line segment; identification of congruent line segments
- b.iii) drawing a line segment of a specified length

1.3

- a) *angles*... types and sizes:
 - a.i) use of protractor to measure the size of a given angle in degrees; identification of congruent angles;
 - a.ii) use of protractor to draw an angle when its measurement is given;
 - a.iii) estimated size of an angle;
 - a.iv) classification of angles by size: *right, straight, acute, obtuse, reflex*;
 - a.v) classification of angles by location and relationships: *adjacent, adjacent on a straight line, at a point, complementary, supplementary, vertically opposite*;
 - a.vi) other angles associated with the intersection of a line with two other lines, *alternate, corresponding and cointerior*; special relationships if the two lines are parallel
- b) calculation of the sizes of unknown angles using concepts / relationships already introduced

1.4

- a) further work with lines and angles; use of ruler and compass to
 - i) construct an angle of 60°
 - ii) bisect and copy an angle
 - iii) construct angles of 30, 90 and 45
 - b.iv) bisect a line/construct its perpendicular bisector

2.0 Plane Figures

(Polygons and Circles)

2.1

- a) definition of a polygon, related concepts and vocabulary: *closed figure, plane, 2D shape, regular, equilateral, equiangular, congruent shapes, irregular, diagonal* → *additional shapes, line(s) of symmetry*;
- b) polygons: their sides and angles:
 - b.i) special names for polygons with 3 - 10 sides;
 - b.ii) identification and informal sketches of polygons with 3 – 10 sides

GEOMETRY AND TRIGONOMETRY

Topic

Sub-topic

2.2

- a) **triangles**, 3-sided polygons:
 - a.i) use of letter names for the sides of the triangle and use of symbols
 - a.ii) classification by length of sides and special properties;
 - a.iii) classification by size of angles;
 - a.iv) identification of types of triangles at sight;
 - a.v) sketches of triangles to match verbal descriptions
- b) angle properties:
 - b.i) sum of interior angles;
 - b.ii) relationship between sides and the angles opp. to them;
 - b.iii) relationship between ext. \angle and interior opposite angles;
 - b.iv) calculation of missing int. \angle s of a triangle and of ext. \angle s of a triangle;
- c) construction of a triangle with help of protractor, when given
 - the length of one side and the size of the angle at each end of that line (side) (SAA); SAS and RHS
- d) More construction: Use of ruler and compass only to construct triangles in which any Given interior angle is 60° , 30° , 45° or 90°

2.3 Circles

- a) Definition of a circle
- b) Identification and names of the parts of a circle, *centre*, *radius*, *diameter*, *chord*, *circumference*, *arc*, *chord* and relationships among them
- c) Use of compass to draw circle of a given radius

3.0 Movement /Transformation

3.1 transformation by **reflection** or flipping:

- a) key concepts and vocab.:
 - *line symmetry*; *line of symmetry* or *fold line*;
 - *reflection*, *image*, *mirror*

GEOMETRY AND TRIGONOMETRY

Topic

Sub-topic

- *image, congruent shapes;*
- b) identification and creation of tessellations and patterns

3.2 Solids

- a) examination of 3D figures in the environment
 - i) identification and description of faces, edges, vertices , base, height/length, cross section
 - ii) properties of prisms and pyramids
- b) nets of solids at a(ii) above

ALGEBRA

Topic

Sub-Topic

1.0 Symbolic Representation and Arithmetic -Type Operations

1.1

- a) use of symbols to represent numbers, operations, relationships:
 - a.i) the concepts: *variable, term, factors of a term, expression, coefficient, constant, base with index/ exponent, like terms*;
 - a.ii) translation of verbal expressions/phrases to algebraic symbols, terms, and/or expressions and vice versa; expressions in their simplest forms;
 - a.iii) types of expressions vis-a-vis number of terms
- b) evaluation of algebraic terms and expressions (numbers for symbols), with special attention to:
 - b.i) the use of the four basic operations (A,S,M,D) with whole & rational numbers;
 - b.ii) the grouping symbols such as brackets and fraction bars;
 - b.iii) the commutative, associative, and distributive properties of numbers including the properties of 0 and 1 ;
 - b.iv) the order of operations
 - b.v) the meaning and use of directed numbers/integers and the basic operations with integers
- c) simplification of algebraic expressions involving
 - c.i) the addition and/or subtraction of like terms;
 - c.ii) the multiplication and division operations;
 - c.iii) fractions in the form
+ -
- d) problem-solving involving the formation, evaluation and simplification of algebraic expressions using concepts, skills, procedures already introduced
- e) Expansion of algebraic expressions in the form $a(x \pm y)$ using distributive law
- f) Factorisation of expressions in the form $ax \pm bx \pm cx$

2.0 Equations

(Identification, Formation & Solution)

2.1

- a) the idea of an equation:
 - a.i) the difference between an expression and an open sentence/ equation ;
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STATISTICS AND PROBABILITY

Topic

Sub-topic

1.0 Statistics (Introductory Ideas)

1.1 general examination of the widespread use of *data* or numerical / quantitative information:

- by whom, from what sources, for what purpose(s);
- distinguishing between facts and opinions

2.0 Data Collection Organisation and Storage

2.1

- a) identification of important or interesting phenomena
 - a.i) in the immediate environment that could/should be investigated; selection of at least two questions to be answered by facts rather than opinions;
- b) collection of data ;
 - b.i) sources of data for a particular situation: (places, persons. books);
 - b.ii) concepts: *relevant data, population , sample population*;
 - b.iii) methods of collection : observation, reading, simple interviews;
 - b.iv) preparation and use of tally sheets and check lists to record *raw data*;
- c) arrangement/organisation of raw data:
 - c.i) use of a simple *frequency distribution table* to show a collection of single facts (data usually arranged in ascending order)

3.0 Graphical Presentation and interpretation of Data

3.1

- a) the use of a variety of visual/graphical forms to aid communication , understanding and use of the available data including:
 - a.i) reading and interpretation of the **pictogram** and **bar graph**, (vertical and horizontal) with special attention to:
 - the use of the vertical and horizontal axes;
 - the scale or key used;
 - the title of the graph
- (b) interpretation of the information shown by the graphs already introduced such as:
 - a.i) identification of number patterns:

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(ii) comparisons between elements of the data given: use of whole numbers, common fractions, percents

4.0 Data Analysis and Interpretation

4.1

- a) measures of central tendency, the *average*:
 - a.i) three ‘averages’ commonly used:
 - the *arithmetic mean*;
 - the *median*;
 - the *mode*
 - b) computation of the mean, median and/or mode from a set of raw scores
 - c) determination of the most appropriate ‘average’ to use in a given situation or for a particular purpose;

5.0 Probability

5.1

- a) Probability: considering the element of uncertainty in everyday experiences; classification of events as
 - (i) *certain, impossible, as likely to happen as not*;
 - (ii) *having a good/poor chance of happening / having a high or low probability of happening*;
- b) experimental probability:
 - b.i) use of experiments to help determine the probability of an event;
 - (ii) use of terms: *experiment, event, outcome, successful or required outcome, possible outcome* in the context of Probability;
relationship between frequency of a required outcome and the number of repetitions of the experiment

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Sub-topics

1.0 The Consumer: Spending for Goods & Services

1.1

- a) use of money for items such as food, clothing, gifts, health care, entertainment:
 - a.i) pricing systems: formats for quoting prices such as \$100 *per doz.*, 5 for \$89;
- b) application of number properties and operations to:
 - b.i) compute total cost and unit cost;
 - b.ii) (ii) find estimated or approximate cost;
 - b.iii) (iii) compute sales tax & GCT;
 - b.iv) (iv) compare *bulk/wholesale & single item(s) buying*: advantages and disadvantages of each;
 - b.v) prepare and use bills, invoices, receipts;
 - b.vi) compute change due from cash tendered for goods
- c) critical examination of *sales, specials, bargains*:
 - c.i) influence of *brand name*;
 - c.ii) determination of 'better buys';
 - c.iii) actual amount and percent of original price saved;
 - c.iv) actual discount and discount%;
- d) problems involving concepts and operations already introduced

1.2

- a) buying and selling transactions/trading:
 - a.i) relationship between

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Sub-topics

- *cost price, marked and/or selling price* of goods;
- *profit, loss; percentage profit, percentage loss;*
- a.ii) computation of: profit or loss and profit or loss percent when cost price and selling price are known;
- b) problems based on the concepts and operations already introduced

2.0 The consumer working and earning

2.1

- a) Sources of income
 - i) full time and part time employment to an employer
 - ii) Self employment (trade, profession, informal vending)
- b) Money earned :
 - i) distinction between salary and wages
 - ii) calculation of regular wage for a fixed time at a fixed rate
 - iii) calculation of monthly or yearly salary