ST. GEORGE'S COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS THIRD FORM COURSE OUTLINE 2015-2016

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 educations, 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!

NB: The Geometry and Trigonometry component of the syllabus will be done in the first and second half of the year respectively.

CHRISTMAS TERM

NUMBER: Number Theory and Computation

Topic	Sub-topics

1.0 Whole Numbers
(Representation, Basic concepts and Operations)
	1.1
	a) approximate values to 3 or more significant figures;
	b) problem solving that uses a mix of strategies including:
	  i) eliminating possibilities;
	  ii) identifying reasonable answers;
	  iii) working backward;
	  iv) checking for hidden assumptions;
	  v) using linear graphs (one or two variables)
	  vi) solving a simpler problem
	
	1.2
	a) numbers written as powers of 10 and in standard form;
	b) evaluation of numbers with fractional indices;
	c) use of the index form to derive cubes and cube roots of numbers.

2.0 Rational and Irrational Numbers	2.1
	a) further use of ratios:
	  i) ratios comparing three or more numbers or quantities;
	  ii) division of a total into three or more unequal parts;
	  iii) combination of unit rates
	  iv) increase or decrease in value by a given ratio
	b)
	  i) direct and inverse proportion;
	  ii)formation and solution of problems involving ratio and/or rate and/or proportion.
	
	2.2 a)
	  i) writing decimal fractions and mixed numbers in standard form i.e. using scientific

notation;

ii) the basic operations with numbers that are written in standard form.

b) approximate values of decimal fractions and mixed numbers correct to 3 or more sig. figures;

3.0 Sets   3.1

a) use of the result, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$, to solve simple numerical problems.

b) the construction and interpretation of Venn diagrams with no more than two sets and/or subsets

ALGEBRA

Topic	Sub-topics

1.0 Symbolic Representation and Arithmetic –Type Operations   1.1

a) evaluation of
  i) terms written in index form with integral indices eg. the value of p^{-3} when $p = 2$;
  ii) terms which are written with powers of powers eg the value of $(y^4)^2$ when $y = 2$;
b) simplification of algebraic expressions involving:
  i) operations with terms with integral indices;
  ii) expansion of terms such as $(p - 3)(x + 4)$, $(x \pm 2)^2$, $(x-3)(x + 4)$
c) factorisation of expressions of the forms:
    (i) ax + bx + cx
    (ii) ax + bx + ay + by
    (iii) $ax^2 + bx + c$
  where a, b, and c are integers
d) simplification of expressions such as
  $+$, $7+$,

EASTER TERM

MEASUREMENT

Topic	Sub-topics
1.0 Perimeter and Circumference (distance around the outside of a shape/region)	1.1 a) length of **any part/arc** of the whole circumference; b) perimeter of a sector of a circle;
2.0 Area (Space covered by a shape or	2.1 area of region covered by i) the sector of a circle; ii) in a rt. angled triangle: relationship between the area of the square on the hypotenuse and the sum of the areas of the squares on the other two sides;
3.0 Volume, Capacity & Mass	3.1 concept of volume: a) (i) the commonly - used unit of measure (cubic cm/ cm3) and its relation to other cubic units; b) calculation of volume of cubes, cuboids, cylinders, triangular prisms; 3.2 concept of capacity: a) the basic unit of capacity (litre) and the relationship between measures of volume and of capacity; b) calculation of the capacity of figures named at (b) above c) solution of problems involving measurements of volume and capacity of solid figures already introduced.

ALGEBRA

Topic	Sub-topics
2.0 Equations (Identification, Formation &	2.1 Solution of equations in the form , $3^x = 81$, $(x + 3)^2 = 36$

Solution)

2.2   the concept: subject of a formula; changing the subject of a formula including formulae with roots and powers.

2.3 solution of simultaneous linear equations in two variables by substitution and elimination

THIRD TERM

RELATIONS, FUNCTIONS AND GRAPHS

Topic	Sub-topics

1.0 Inequalities

1.1   further study of the equation of the form y = mx + c and its graph to determine
i) the gradient/slope
ii) the distance between 2 points on the line
iii) the coordinates of the midpoint of the line
iv) the y - intercept

1.2   (a) use of the number line to show solution set: inequalities with two variables including
(i) straight lines such as y < x +1 , y = x +1, y > x +1 or y = x +1 identification of the **region** which contains the solution set for each
(b) problem-solving which involves translation of words to inequalities in two variables and interpretation of the solution sets.

STATISTICS AND PROBABILITY

Topic	Sub-topic

2.0 Data Collection Organisation and Storage

2.1

a) at the national level: issues of national and international significance
b) collection of data (from a very large population): use of polls and large-scale surveys;
c) use of a frequency table for grouped data; attention to:
   - size & number of groups
   - class intervals and class boundaries
d) i) storage of data for future use: (tables, cards, a computerised data base);
   ii) retrieval of stored data

**3.0 Graphical Presentation and
Interpretation of Data**

3.1

a)
   i) use of **line graphs**: one or more lines as needed
   ii) use of **histograms** to show ungrouped and/or grouped data (equal classes)
   iii) use of **frequency polygons** (grouped data in equal class intervals)
b)
   i) identification of what might be misleading in the representation
   ii) use of the data shown on graphs to make inferences and predictions.

**4.0 Data Analysis and
Interpretation**

4.1   computation of the mean from a frequency distribution with grouped data, where X, in
       the formula previously used, is the mid-point of the interval

5.0 Probability

5.1   theoretical probability:
       a) use of results of experimental probability to develop theoretical probability;
       b) determination of theoretical probabilities of simple events

CONSUMER ARITHMETIC

Topic   **Sub-topics**

**1.0 The Consumer: Spending
for Goods & Services**

1.1

a) compute cost of goods by hire-purchase agreement:
    -stated cost, down payment, instalments, final cost
b) services needed from professionals and/or institutions & the cost

2.0 Money Management

2.1   decision-making: the wise use of income e.g. cash purchases versus hire purchase

2.2   **compound interest** (CI) applied over time to the original Principal plus the interest
       already earned: computation of CI on a given Principal at a given rate for, at most, three
       periods.

2.3   Discount, (Bills and Salary and Wages).

GEOMETRY AND TRIGONOMETRY

Topic   **Sub-topics**

1.0 Basic Geometric Concepts   1.1   use of compasses to construct a ^ to a line at a point in the line and from a point outside the line

1.2

  a) use of compasses to copy an angle and to construct a line parallel to a given line;
  b) use of ruler and compasses only to draw an angle of size any part or multiple of 60°;

2.0 Plane Figures   2.1

  a) identification and naming of chord, segment,, angle in a segment, and sector;
  b) drawing and naming chords, segments, sectors to specification
  c) length of arc and its relationship to the angle it subtends at the centre;
  d) area of sector and its relationship to the angle which its radii form at the centre
  e) relationships among angles in a circle:
     i) angle at the centre and angle at the circumference
     ii) angles in the same segment subtended by the same arc;
     iii) angle in a semicircle;
     iv) opposite angles of a cyclic quadrilateral;
     v) exterior angle of a cyclic quadrilateral and the interior opposite angle

2.3   a) relationship between the sides of a right-angled triangle (Pythagoras' Theorem); calculation of the length of one side when the lengths of the other 2 are known
       b) construction of triangles: application, as required or as appropriate, of a combination of the concepts and skills already introduced
2.4   construction of quads. when given one or both diagonals (rhombus, rect., kite, parall.)

GEOMETRY AND TRIGONOMETRY

Topic   **Sub-topics**

3.0 Solid / Three-Dimensional Figures   3.1

a) further examination of 3-D figures in the environment:
  i) identification & description of faces, edges, vertices, space between edges, base, height/length, cross-section
  ii) properties of rectangular prisms, cubes, cylinders;
b) nets of solids named at (a)(ii);
c) representation of 3-D figures on plane (2-D) surfaces;

3.2   a) measurements associated with three-dimensional shapes:
  i) the **volume** or space occupied by an object or container:
  ii) measurement of the space in cubic units; relationship between the area of the base, the height/length/depth and the volume;
  iii) preferred shapes for packaging goods;

b) the **capacity** of a container / the amount it can hold when full:
  i) relationship between volume and capacity…the units of measurement;
  ii) capacity, when affected by the thickness of the material that makes the container; the volume of the material;
  iii) calculation of capacity

c) problem-solving requiring application of concepts related to the properties of three-dimensional figures

4.0 Movement /Transformation   4. 1

a)   congruence of shapes
b)   similar shapes
c)   enlargement
    i) positive and fractional
    ii) finding the centre of enlargement
    iii) determining the scale factor

5.0 Trigonometry
(Measures of Sides and
Angles of any Triangle)

5.1

a) for the right-angled triangle:
      i) use of Pythagoras' Theorem
         -to link the measures of the sides;
         -to find the length of a missing side;
      ii) use of **trigonometric ratios** of the lengths of the sides, where the 'legs' are related
        to one of the acute angles, (*sine, cosine, tangent*) to find missing sides and/or
        angles;
      iii) problem-solving which requires
         -making sketches and diagrams to represent information given verbally;
         -choice of trigonometric ratio that links known to unknown;
         -efficient use of the scientific calculator;
         - rounding answers to the nearest degree and appropriate number of dec. places
          or sig. figs.

b) use of trig. ratios to find heights and distances in simple three-dimensional
     situations:
     -concepts: *angle of elevation, angle of depression*.

6.0 Vectors & Matrices

6.1
a) the unit vector as a vector of unit length
b) combination of vectors:
        i) addition and subtraction of vectors (resultant vector)
        ii) use of triangle law or parallelogram law to calculate resultant vector
6.2
a) use of matrix to show numerical information/statistical data in rows and columns
b) order of a matrix – number of rows and columns in that sequence
c) type of matrix based on its order
d) addition and subtraction of matrices of the same order
e) multiplication of matrices of the same order and scalar multiplication