**STAGE 1 MATHEMATICS**

**PROGRAM 3 – SEMESTER 2**

This program is for a cohort of students intending to continue to Mathematical Methods at Stage 2. The following program describes the second semester of learning.

**SEMESTER TWO – 17 WEEKS INCLUDING EXAM WEEK AND STUDENT DEVELOPMENT/ACTIVITY WEEK**

* Topic 3 – Trigonometry Subtopics 3.2 and 3.3 (3 weeks)
* Topic 4 – Counting and Statistics Subtopic 4.1 (3 weeks)
* Topic 12 – Real and Complex Numbers Subtopic 12.3 (2 weeks)
* Topic 2 – Polynomials Subtopic 2.2 (2 weeks)
* Topic 1 – Functions and Graphs Subtopic 1.2 (1 week)
* Topic 5 – Growth and Decay Subtopics 5.1, 5.2 and 5.3 (4 weeks)

**Topic 3 – Trigonometry Subtopics 3.2 and 3.3 (3 weeks)**

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| Term  week | **Subtopic** | | **Concepts and Content**  Technology is incorporated into all aspects of this topic as appropriate | **Assessment Task** |
| WEEK 9 TERM 2 BEGINNING OF SEMESTER TWO - STUDENT DEVELOPMENT WEEK - CAREERS, POSITIVE EDUCATION | | | | |
| 2-10 | | 3.2  Circular Measure and Radian Measure | Introduction to the unit circle and its properties  How the unit circle is linked to graphs of and   * The link between the unit circle and , and in degrees * The unit circle definition of , and and periodicity using degrees   Definition of radian measure   * Conversion between radian and degree measure   Calculation of the lengths of arcs and areas of sectors of circle |  |
| 3-1 | | 3.3  Trigonometric Functions | Connection between unit circle and , and in radians  Determine the exact value of cosine and sine from multiples of and using unit circle or graphs  Making the connection that the functions and best describe the horizontal and vertical positions around a circle  Explore the features of and   * Amplitude and * Period and * Phase and   Solve practical problems in a range of different contexts |  |
| 3-2 | | Solve trigonometric equations both algebraically and graphically   * Only consider cases such as and   Special relationships observed of sine and cosine functions      Tangent function   * Consider the relationship between the angle of inclination and the gradient of a line * The relationship * Graphs of the functions |  |
| 3-3 | |  | **Revision and SAT 1** | **SAT 1**  Subtopics  3.2 and 3.3  Calculator permitted |

**Topic 4 – Counting and Statistics Subtopic 4.1 (3 weeks)**

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| **Term Week** | **Subtopic** | **Concepts and Content**  Technology is incorporated into all aspects of this topic as appropriate | **Assessment Task** |
| 3-4 | 4.1  Counting | The Multiplication Principle   * The idea that if there are **a** ways of doing something and **b** ways of doing another thing, then there are **a** × **b** ways of performing both actions. Examples of tree diagrams, tables etc   Factorials and Factorial Notation   * The factorial of a [non-negative integer](http://en.wikipedia.org/wiki/Non-negative_integer) n, denoted by n!, is the [product](http://en.wikipedia.org/wiki/Product_(mathematics)) of all positive integers less than or equal to *n*. For example, 4!=4×3×2×1=24   Permutations   * Counting of all possible arrangements of a collection of things (discrete), where the order is important      * Using only discrete variables, students explore various examples. Initially algebraically, then using technology. |  |
| 3-5 | Combinations   * The number of ways to select different groups in which the order does not matter * The number of combinations of objects taken from a set of distinct objects is * Using only discrete variables, students explore various examples. Initially algebraically, then using technology.   Use of the notation   * The coefficients of the expansion of   + Expand for integers   + Recognise the numbers as binomial coefficients   + The pattern connecting the values of leading to Pascal’s triangle |  |
| 3-6 |  | **Revision and consolidation** |  |

**Topic 12 – Real and Complex Numbers Subtopic 12.3 (2 weeks)**

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| **Term- Week** | **Subtopic** | **Concepts and Content**  Technology is incorporated into all aspects of this topic as appropriate | **Assessment Task** |
| 3-7 | 12.3  Complex Numbers | Introduction to the imaginary number , and its definition as . Exemplify its use in solutions to equations such as  Introduction to complex numbers: and defining the real and imaginary components  Operations with complex numbers, including the use of   * Addition, subtraction, multiplication and division * Complex conjugates * Readdress the quadratic formula in the context of complex number solutions |  |

**Topic 2 – Polynomials Subtopic 2.2 (2 weeks)**

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| **Term- Week** | **Subtopic** | **Concepts and Content**  Technology is incorporated into all aspects of this topic as appropriate | **Assessment Task** |
| 3-8 | 2.2  Cubic and quartic polynomials | Definition of a cubic  Terminology, degree and forms   * General * Point of Inflection * Factored   Features   * Shape reference to leading coefficient * Behaviour as * Nature and number of zeros of the graph of a cubic   Explore features of cubics written as a product of:   * A linear factor and a quadratic (both real and non-real zeros) * Three linear factors   Determining cubic functions from given zeros and one other piece of data  Definition of a quartic  Terminology, degree and forms as an extension of the work on cubics  Cubic and quartic modelling (using technology)  Determining unknown variables  Optimisation such as dimensions for maximum volume | **INVESTIGATION**  Features of Polynomials |
| 3-9 |  | **Revision and SAT 2**  **Investigation Due** | **SAT 2**  Subtopics 4.1, 12.3, 2,2  Calculator permitted |

**Topic 1 – Functions and Graphs Subtopic 1.2 (1 week)**

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| **Term- Week** | **Subtopic** | **Concepts and Content**  Technology is incorporated into all aspects of this topic as appropriate | **Assessment Task** |
| 3-10 | 1.2  Inverse Relationships | Exploring the mathematical relationship where one variable decreases as the other increases  Consider the graph of the basic hyperbola   * Define asymptote, both horizontal and vertical   Consider translations of the basic hyperbola i.e.  The use of technology is incorporated in the graphs above |  |

**Topic 5 – Growth and Decay Subtopics 5.1, 5.2 and 5.3 (4 weeks)**

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| **Term- Week** | **Subtopic** | **Concepts and Content**  Technology is incorporated into all aspects of this topic as appropriate | **Assessment Task** |
| 4-1 | 5.1  Indices and Index Laws | Indices   * Review indices and index laws including negatives and fractional * Algebraic application to all laws including simplification using positive, negative and fractional indices * Conversions from radical to fractional indices   Surds   * Definition of rational and irrational numbers * Operations with surds and fractional indices (rational indices) * Discussion on the real number system and its inclusion of irrationals |  |
| 4-2 | 5.2  Exponential Functions | Exponentials   * Exponential functions - their algebraic properties and uses * Behaviour of exponential functions * Technology will be used to explore the qualitative features of the graph of , its translations and and dilation * Discussion on characteristics such as asymptotes, intercepts and behaviour as * \*Use of real life situations to determine variables in the contexts such as bacteria growth, radioactive decay, half-life, population models and compounding interest. Technology is used to support interpretation of situations. |  |
| 4-3 | 5.3  Logarithmic Functions | Definition of a logarithm, initially base 10   * Rules, initially base 10   This could be extended to logarithms with bases other than 10 (e.g. base *e*)   * Application of rules with other bases   Solving of logarithmic equations (base 10)  Solving exponential equations using logarithms (base 10) threaded back to exponentials dot point 5\* (from subtopic 5.2) |  |
| 4-4 |  | **Revision and SAT 3** | **SAT 3**  Subtopics 1.2, 5.1, 5.2 and 5.3  Calculator permitted |
| 4-5 | **EXAMINATION REVISION** | | |
| 4-6 | **YEAR 11 EXAMS** | | |