Stage 1 Mathematical Methods – Semester One

Topic 1: Functions and Graphs, Topic 2: Trigonometry & Topic 3: Counting and Probability

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|  | **Lesson 1 – Single Lesson** | **Lesson 2 – Single Lesson** | **Lesson 3 – Double Lesson** |
| **Term One**  **Week 1**  Mon 27th Jan | **Course Overview & Expectations**   * What to bring to class * Appropriate calculators | **TOPIC ONE: FUNCTIONS AND GRAPHS**  Introduction to linear relationships   * Linear related variables * Direct proportion | Finding equations of lines using   * Two points * A slope and a point * An equation of a parallel or perpendicular line and a given point |
| **Week 2**  Mon 3rd Feb | Distance between points | Midpoint | Graph features of linear functions   * Slope & y intercept   Point of intersection of two lines   * How do we determine if the lines are parallel or perpendicular * Solving intersection points graphically |
| **Week 3**  Mon 10th Feb | Point of intersection of lines   * Solving intersection points algebraically | Introduction to quadratic relationships   * Construction of quadratic relationships | Graph features of quadratic graphs  (   * How the above equations related * Parabolic nature * Intercepts * Turning points * Axes of symmetry * The use of technology for quadratics |
| **Week 4**  Mon 17th Feb | Factorization of quadratics to determine zeros | Quadratic formula to determine zeros | Completing the square to find turning points  Discriminant   * Number of zeros * Nature of the zeros |
| **Week 5**  Mon 24th Feb | Using technology to find solutions to quadratics and graphing. | Connection between solutions of a quadratic equation, algebraic representation and the graph.   * Sum and product of zeros (including surds revision) | Determining quadratic models from zeros and another piece of information   * Algebraically * By hand * Discriminant * Graphic Calculator |
| **Week6**  Mon 3rd March | Introduction to inverse relationship and the features of the graph of , including horizontal and vertical asymptotes. | **MATHEMATICAL INVESTIGATION** | Introduction to the cubic function   * Terminology (leading coefficient, degree) * Behaviour of cubic functions (shape, zeros) * What happens as * The effect when   Algebraic forms of a cubic (linear and quadratic, three linear) and the impact of these forms on shape and number of zeros. |
| **Week 7**  Mon 10th March | Equations of circles in:   * Center and radius form * Expanded form | Graphs and features of of and   * Axis of symmetry * Parabolic shape | Functions   * Functions verses relations * Vertical line test * Function notation * Domain and range |
| **Week 8**  Mon 17th March | What can we tell from points on a graph   * Dependent and independent variables * Labelling axis * Domain and range | Translation or dilation of linear, quadratic and cubic graphs | **MATHEMATICAL INVESTIGATION**  **(CONTINUED)**  REVISION |
| **Week 9**  Mon 24th March | **FUNCTIONS AND GRAPHS TEST** | **TOPIC TWO: TRIGONOMENTRY**  Revision of right angled problems involving Pythagoras theorem and trigonometric ratios | Cosine rule to solve non right angled problems   * Unknown angle * Unknown length |
| **Week 10**  Mon 31st  March | Sine rule to solve non right angled problems   * Unknown angle * Unknown length | Non right angled problems  Sine Rule for both unknown angle or length | Solving any triangle problems with multiple rules  Area of non-right angled triangle |
| **Week 11**  Mon 7th April | Graphs of and | Connection between unit circle and , and in degrees | What is the radian measure and how to convert between degrees and radians  Calculate lengths of arcs and areas of sectors of circle. |
| Term Two  **Week 1**  Mon 28th April | Connection between unit circle and , and in radians  Determine the exact value of cosine and sine form multiple of and using unit circle or graphs | Making the connection that the functions and best describe the horizontal and vertical positions around a circle. | Graph the general functions   * Recognise changes in amplitude, period and phase |
| **Week 2**  Mon 5th May | Graph the general functions  Recognise changes in amplitude, period and phase | Using knowledge of and to draw graphs and solve practical problems. | Solving trigonometric equations   * Using technology * Using basic algebra |
| **Week 3**  Mon 12th May | Solving basic trigonometric equations using algebra | Special relationships observed of sine and cosine functions  , , , | Tangent function  Graphs of tan functions |
| **Week 4**  Mon 19th May | Revision | **TRIGONOMETRY TEST** | **TOPIC THREE: COUNTING AND PROBABILITY**  Introduction to counting   * The multiplication principle * Factorials and factorial notation * Permutations |
| **Week 5**  Mon 26th May | Combinations | Combinations | The connection between combinations and the coefficients of the expansion  Connection between Pascals triangle and |
| **Week 6**  Mon 2nd June | Revision of probability (0 to 1)  Review of probability terminology  Relative frequencies to estimate probability and graph the probability verses number of trials | Tree diagrams and multiplication principle | Independent and dependent events for probability. |
| **Week 7**  Mon 9th June | Connection between tree diagrams and notations | Revision | **COUNTING AND PROBABLITY TEST** |
| **Week 8**  Mon 16th June | EXAM REVISION | EXAM REVISION | **FORMATIVE MID YEAR EXAM** |

Stage 1 Mathematical Methods – Semester Two

Topic 4: Statistics, Topic 5: Growth and Decay & Topic 6: Introduction to Differential Calculus

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|  | **Lesson 1 – Single Lesson** | **Lesson 2 – Single Lesson** | **Lesson 3 – Double Lesson** |
| **Term 2**  **Week 10** | **TOPIC FOUR: STATISTICS**  Discrete verses continuous random variables | Revision of mean, median, mode. | Measures of Spread   * Review range * Review interquartile range * Standard Deviation (including calculating for small data sets) * Strengths and Weaknesses of measures of spread * Use of technology to calculate |
| Term Three  **Week 1** | Comparing data sets with mean and standard deviation (including undertaking the calculations) | Using a spreadsheet to understand why normal distributions occur. | Using a spreadsheet to see features of a normal distribution   * Bell * Position of mean * Symmetry about mean * Characteristics of spread * Standard deviation * 68% * Examples of real life normal distributions |
| **Week 2** | Use normal distribution models to make predictions and answer questions. | Use normal distribution models to make predictions and answer questions. | Revision |
| **Week 3** | **STATISTICS TEST** | **TOPIC FIVE: GROWTH AND DECAY**  Where are indices used in the real world to solve problems?  Review of indices and index laws  *Ex 2D.1 Functions Textbook* | Converting to and from radical and exponent form.  Review operations with both surds and fractional indices.  *Ex 2D.2 Functions Textbook* |
| **Week 4** | Scientific Notation   * Express large and small numbers in scientific notation. * How does the calculator express these numbers | Significant figures | Exponential Relationships   * Examples * Behaviours * Features of exponential graphs |
| **Week 5** | Exponential graph translations | Exponential graph translations | Solving exponential problems   * Algebraically |
| **Week 6** | Solving exponential problems   * Graphically | Logarithms   * Understanding we need logarithms to find exact solutions * Definition of a logarithm of a numbers * Logarithm rules | **INVESTIGATION** |
| **Week 7** | Solving exponential equations using logarithms (base 10) | Solving exponential equations using logarithms (base 10) | REVISION |
| **Week 8** | **MATHEMATICAL INVESTIGATION**  **(CONTINUED)** | **GROWTH AND DECAY TEST** | **TOPIC SIX: INTRODUCTION TO DIFFERENTIAL CALCULUS**  What is a rate of change |
| **Week 9** | How can we find the rate of change over a non-linear interval:   * Average Rate of change | How can we find the rate of change over a non-linear interval:   * Average Rate of change | Connection between average rate of change and the slope of the chord  Notation of for |
| **Week 10** | How do we approximate the rate of change at a point (instantaneous rate of change) | Understanding what a limit is? | Instantaneous rate of change using derivatives from first principles at a point |
| Term Four  **Week 1** | Finding the derivative from first principles | Finding the derivative from first principles | Derivative Rule: |
| **Week 2** | Rules that apply to derivatives | Practising differentiation rules | Equation of tangent |
| **Week 3** | Review of Sign Diagrams | Review of Sign Diagrams | Displacement and velocity |
| **Week 4** | Increasing and decreasing functions | Maximum, minimum, (local and global) | Optimisation |
| **Week 5** | Further application of derivatives | Further application of derivatives | REVISION |
| **Week 6** | **INTRODUCTION TO DIFFERENTIATIAL CALCULUS TEST** | EXAM REVISION | EXAM REVISION |
| **Week 7** | **EXAM WEEK: FORMATIVE EXAM** | | |