Stage 2 - General Mathematics Program 2

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|  | **Lesson 1 – Single Lesson** | **Lesson 2 – Single Lesson** | **Lesson 3 – Double Lesson** |
| **Term One**  **Week 1** | **Course Overview and Expectations** | **TOPIC ONE: MODELLING WITH LINEAR RELATIONSHIPS**  How to represent linear functions (Review from Stage 1)   * Contextual description * Numerical sequence * Graph * Algebraic formula | How to represent linear functions (Review from Stage 1)   * Contextual description * Numerical sequence * Graph * Algebraic formula |
| **Week 2** | Simultaneous equations   * Trial by error solving | Simultaneous equations   * Graphically * Equation solver | Simultaneous equations   * Non-unique solutions |
| **Week 3** | Introduction to linear programming  (practical problem that students attempt to solve without using linear programming techniques) | Introduction to linear programming  (practical problem that students attempt to solve without using linear programming techniques) | Going from solving by trial and error to using linear programming techniques   * How to set up constraints * How to graph constraints and the feasible region * Vertices * Creating the objective function * Finding the optimal solution |
| **Week 4** | Linear programming problems | Wastage consideration | How to deal with a non-integer optimal solution |
| **Week 5** | Changes to parameters and the effect on the optimal solution | Putting everything together in linear programming | Putting everything together in linear programming  **REVISION** |

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|  | **Lesson 1 – Single Lesson** | **Lesson 2 – Single Lesson** | **Lesson 3 – Double Lesson** |
| **Week 6** | **SAT 1 - MODELLING LINEAR RELATIONSHIPS**  **Non – Calculator Section – 30 min**  **Calculator Section – 20 min** | **TOPIC TWO: MODELLING WITH MATRICES**  Connectivity matrices   * Creating a connectivity matrix from a network * Creating a network from a matrix | Connectivity matrices   * Powers of matrices and multi-stage connections * Limitation of using higher powers |
| **Week 7** | Weighted sums of the powers of connectivity matrices   * Measures of efficiency or redundancy * Reasonableness and limitations | Weighted sums of the powers of connectivity matrices   * Measures of efficiency or redundancy * Reasonableness and limitations | Weighted sums of the powers of connectivity matrices   * Dominance * Reasonableness and limitations |
| **Week 8** | Weighted sums of the powers of connectivity matrices   * Dominance * Reasonableness and limitations | Transition matrix   * 2 x 2 systems * Predicting future trends | Transition matrix   * 2 x 2 systems * Predicting future trends |
| **Week 9** | Transition matrix   * Steady state | Transition matrix   * Do change of conditions effect the steady state | Transition matrix   * 3 x 3 systems and higher |
| **Week 10** | Transition matrix   * Putting it all together * Limitations of transition matrix models | **REVISION** | **SAT 2 - MODELLING WITH MATRICES** |

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|  | **Lesson 1 – Single Lesson** | **Lesson 2 – Single Lesson** | **Lesson 3 – Double Lesson** |
| **Week 11** | **TOPIC FOUR: FINANCIAL MODELS**  Compound interest review   * Solving by graphic calculator for FV, PV, n, and I | Compound interest review   * Solving by graphic calculator for FV, PV, n, and I | “What if …?” questions around solving for:   * Future value * Regular deposit * Number of periods * Interest rate * Value of the accumulating savings after a given period * Total interest earned |
| **Term Two**  **Week 1** | “What if …?” questions around solving for:   * Future value * Regular deposit * Number of periods * Interest rate * Value of the accumulating savings after a given period * Total interest earned | “What if …?” questions around solving for:   * Future value * Regular deposit * Number of periods * Interest rate * Value of the accumulating savings after a given period * Total interest earned | Factors to consider when looking at an investment   * Interest as part of taxable income * Institution and government charges * Effects of inflation |
| **Week 2** | Comparing investments (effective rate) | Comparing investments (effective rate) | How can regular income be provided from savings?   * Annuities * Superannuation |
| **Week 3** | Costs associated with borrowing money | Interest only loans and sinking funds | Interest only loans and sinking funds  **MATHEMATICAL INVESTIGATION ONE** |
| **Week 4** | Reducing balance loans   * Finding the repayment needed * Total interest paid * Size of the debt after given time | How can the interest paid on a loan be reduced?   * Increasing the value of the payments * Reducing the term of the loan | How can the interest paid on a loan be reduced?   * Increasing the frequency of payments * Paying a lump sum off the principal owing * Changing interest rates * Offset accounts   **MATHEMATICAL INVESTIGATION ONE** |

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| **Week 5** | How can the interest paid on a loan be reduced?   * Increasing the frequency of payments * Paying a lump sum off the principal owing * Changing interest rates * Offset accounts | **MATHEMATICAL INVESTIGATION ONE** | Nominal rate of interest quoted – what is really being paid?   * Discussion of loan interest rates (fixed/variable) * Interest paid * Calculation to compare two or more loans |
| **Week 6** | **REVISION** | **SAT 3 – FINANCIAL MODELS** | **TOPIC FIVE: DISCRETE MODELS**  Critical path analysis problems   * Precedence tables * What can we tell from precedence tables |
| **Week 7** | Critical path analysis problems   * Drawing networks | Critical path analysis problems   * Understanding dummy links | Forward and backward scan   * Minimum completion time * Critical path |
| **Week 8** | Forward and backward scan   * Earliest and latest starting times * Slack time | Forward and backward scan   * Earliest and latest starting times * Slack time | The effects of changing initial parameters on   * Minimum completion time * Critical path |
| **Week 9** | **MID YEAR EXAM WEEK** *(formative tasks and flexibility in program)* | | |
| **Week 10** | Assignment problems:  The Hungarian algorithm   * Finding minimum cost | Assignment problems:  The Hungarian algorithm   * Finding minimum cost | Assignment problems: The Hungarian algorithm   * Finding maximum profit   **MATHEMATICAL INVESTIGATION TWO** |
| **Term Three**  **Week 1** | Assignment problems:  The Hungarian algorithm   * Finding maximum profit | Assignment problems:  The Hungarian algorithm   * Non-square arrays | Assignment problems: The Hungarian algorithm   * Non-square arrays   **MATHEMATICAL INVESTIGATION TWO** |

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|  | **Lesson 1 – Single Lesson** | **Lesson 2 – Single Lesson** | **Lesson 3 – Double Lesson** |
| **Week 2** | Further practice with assignment problems | **REVISION** | **SAT 4 - DISCRETE MODELS**  **Non-Calculator test**  **MATHEMATICAL INVESTIGATION TWO** |
| **Week 3** | **TOPIC THREE: STATISTICAL MODELS**  Review the statistical investigation process and work through an example of paired data | How do we model bivariate data?   * Explanatory and response variables * Scatterplots * Association | Correlation coefficients |
| **Week 4** | The effect of outliers | Causality | Linear regression   * Interpretation of a and b |
| **Week 5** | Linear regression   * Residual plots | Linear regression   * Residual plots | Exponential regression   * Interpretation of a and b |
| **Week 6** | * Interpolation and extrapolation | Linear and exponential regression   * Putting it all together | Linear and exponential regression   * Putting it all together |
| **Week 7** | Linear and exponential regression   * Putting it all together | The normal distribution   * Parameters µ and σ * Bell Shape * Symmetry about the mean | The normal distribution   * Building the spreadsheet * Investigation of properties of the resulting distribution |
| **Week 8** | Area under the curve   * 68%, 95%, 99.7% rule * Calculations of one, two, and three standard deviations from the mean | Calculation of probabilities using electronic technology | Inverse normal calculations |
| **Week 9** | **REVISION** | **REVISION** | **SAT 3 - STATISTICAL MODELS** |
| **Week 10** | *Flexibility in program* | *Flexibility in program* | *Flexibility in program* |
| **Term Four**  **Week 1 and 2** | **Examination revision** | | |
| **Week 3** | **SWOT VAC** | | |
| **Week 4** | **EXAM** | | |