**STAGE 1** MATHEMATICS

PROGRAM 2 – SEMESTER 1 (PRE-SPECIALIST MATHEMATICS)

This program is for a cohort of students intending to continue to Specialist Mathematics at Stage 2. The following program describes the first semester of learning.

**Topic 7: Arithmetic and Geometric Sequences and Series, Topic 8: Geometry, and Topic 9: Vectors in the Plane**

**ASSESSMENT**

**Assessment for one semester (10 credits):**

* at least 2 SATs
* at least one investigation
* each Assessment Type has weighting of at least 20%
* **total of four tasks** for assessment

**NOTES**

* Schools may have a different week breakdown per term/semester.
* Not all schools will have a semester examination.
* Excursions, sports days, extra-curricular activities are not specified.
* The investigation opportunities are a guide for ideas.

**TOPIC TIME DURATION**

Arithmetic and Geometric Sequences and Series – 3 weeks

Geometry – 4 weeks

Vectors in the Plane – 8/9 weeks

| **Term 1**  **Week** | **Topic** | **Content** | **Assessment** |
| --- | --- | --- | --- |
|  | **Topic 7: Arithmetic and Geometric Sequences and Series (3 weeks)** |  |  |
| 1 | Subtopic 7.1  Arithmetic Sequences and Series | Find and use the general formula for an arithmetic sequence.  Find the value of a term or the position of a term.  Graphs of the growth and link with algebraic rule.  Sum of series and associated problems. |  |
| 2 | Subtopic 7.2  Geometric Sequences and Series | Formula for a geometric sequence in recursive form and general form, noting exponential nature.  Graphs and the notion of limit as , shape of the graph. |  |
| 3 | Subtopic 7.2  Geometric Sequences and Series | Sum of the sequence and investigation of the case when |r|<1 as .  Revision. | **SAT 1: Arithmetic and Geometric Sequences and Series**  Part 1 – no calculators  Part 2 – calculators permitted |
|  | **Topic 8: Geometry**  **(4 weeks)** |  |  |
| 4 | Subtopic 8.1  Circle Properties | Investigate properties of circles using Geogebra (or other technology). |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 5 | Subtopic 8.1  Circle Properties | Undertake problem solving using the properties. | **INVESTIGATION**  Viewing the height of a tower |
| 6 | Subtopic 8.2  The Nature of Proof | Using a variety of proof techniques justify the circle properties. |  |
| 7 | Subtopic 8.2  The Nature of Proof | Using a variety of proof techniques justify the circle properties. | **SAT 2: Geometric Proof** |
|  | **Topic 9: Vectors in the Plane**  **(8 weeks)** |  |  |
| 8 | Subtopic 9.1  Vector Operations | Introduce vectors:  Magnitude and direction.  Vector addition, subtraction, scalar multiplication. |  |
| 9 | Subtopic 9.1  Vector Operations | Parallel vectors, ratio of division. |  |
| 10 | Subtopic 9.2  Component and Unit Vector Forms | Ordered pair notation, column vector notation, combination of vectors, unit vectors, and position vectors. |  |
| 11 | Subtopic 9.2  Component and Unit Vector Forms | Vectors in component form and unit vector form.  Length and direction of a vector from its components. |  |
| **Term 2**  **Week** |  |  |  |
| 1 | Subtopic 9.3  Projections | Dot (scalar)product, angle between two vectors |  |
| 2 | Subtopic 9.3  Projections | Perpendicular vectors, parallel vectors. |  |
| 3 | Subtopic 9.4 Geometric Proofs using Vectors | Vector proofs for  • The diagonals of a parallelogram meet at right angles if and only if it is a rhombus   * Midpoints of the sides of a quadrilateral join to form a parallelogram |  |
| 4 | Subtopic 9.4 Geometric Proofs using Vectors | • The sum of the squares of the lengths of the diagonals of a parallelogram is equal to the sum of the squares of the lengths of the sides. |  |
| 5 |  | Revision |  |
| 6 |  |  | **SAT 3: Vectors in the Plane**  Part 1 – no calculators  Part 2 – calculators permitted |
| 7 |  | **EXAMINATION REVISION** |  |
| 8 |  | **YEAR 11 EXAMS** |  |

Some other Investigation opportunities may include: Best angle for a shot at goal standing on an arc or at a penalty spot in a variety of sports (soccer, hockey, rugby), Best position to sit in a picture theatre, Best positions for art work in a gallery, Applications of vectors, e.g. Bezier Curves, Two Boats.