**STAGE 1** MATHEMATICS

PROGRAM 2 – SEMESTER 2 (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 second semester of learning.

**Topic 10: Further Trigonometry, Topic 11: Matrices, and Topic 12: Real and Complex Numbers**

**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**

Further Trigonometry – 5 weeks

Matrices – 5 weeks

Real and Complex Numbers– 6 weeks

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| **Term 3****Week**  | **Topic** | **Content** | **Assessment** |
|  | **Topic 10: Further Trigonometry** **(5 weeks)** |  |  |
| **1** | Subtopic 10.1Further Trigonometric Functions*(Assumes Topic 3: Trigonometry has been covered before this topic)* | Explore the effects of A, B, C and D in the general formula  compared to  and extend to cosine and tangent functions.Sketch graphs with and without technology. |  |
| **2** | Subtopic 10.1 Further Trigonometric Functions | Sketch graphs with and without technology (continued).Solve trigonometric equations graphically and with technology. |  |
| **3** | Subtopic 10.2 Trigonometric Identities | Use the unit circle, compare graphs and use addition and subtraction formulae to deduce identities. |  |
| **4** | Subtopic 10.2 Trigonometric Identities | Use identities algebraically to establish relationships.Derive $A \sin(x)+B\cos(x)=k\sin(\left(x+a\right))$ and find expressions for $k, \cos(α )and\sin(α)$. |  |
| **5** | Subtopic 10.2 Trigonometric Identities | Sketch graphs and of the reciprocal trigonometric functions.Revision. | **SAT 1: Further Trigonometry**Part 1 – no calculatorsPart 2 – calculators permitted |

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|  | **Topic 11: Matrices****(5 weeks)** |  |  |
| **6** | Subtopic 11.1Matrix Arithmetic | Order of matrices.Addition, subtraction and scalar multiplication.Matrix multiplication |  |
| **7** | Subtopic 11.1Matrix Arithmetic | Identity matrix.Inverse of square matrices, concept of singular matrices. |  |
| **8** | Subtopic 11.1Matrix Arithmetic | Find the inverse of 2x2 matrices.Solve AX=B or XA=B when the inverse exists. |  |
| **9** | Subtopic 11.2Transformations in the Plane | Ordered pairs as column or row matrices.Translations; dilations, rotations, reflections. |  |
| **10** | Subtopic 11.2Transformations in the Plane | Inverses of linear transformations.Application of encrypting codes and decrypting.Revision | **SAT 2: Matrices****INVESTIGATION**Hills cipher using 2x2 matrices and modulo 26 |
| **Term 4****Week** |  |  |  |
|  | **Topic 12: Real and Complex Numbers****(6 weeks)** |  |  |
| **1** | Subtopic 12.1 The Number Line | Rational and Irrational numbers.Prove some simple results.Interval notation. |  |
| **2** | Subtopic 12.2 Introduction to Mathematical Induction | Ladder/Dominoes example.Initial statement, inductive step. |  |
| **3** | Subtopic 12.2 Introduction to Mathematical Induction | Initial statement, inductive step.Examples – with reference to Topic 7: Arithmetic and Geometric Sequences and Series |  |
| **4** | Subtopic 12.3Complex Numbers | Introducing  and reasons for its use.Complex numbers: real and imaginary parts.Conjugates, addition, subtraction, multiplication and use  , division. |  |
| **5** | Subtopic 12.4 The Complex (Argand) Plane |   as (a, b) or [a, b].Use vector addition in the complex plane.Conjugate of  and modulus  . |  |
| **6** | Subtopic 12.5 Roots of Equations | Factorise quadratics into linear factors; use of quadratic formula involving *i.* |  |
| **7** |  |  | **SAT 3: Real and Complex Numbers**Part 1 – no calculatorsPart 2 – calculators permitted |
| **8** |  | **EXAMINATION REVISION** |  |
| **9**  |  | **YEAR 11 EXAMS** |  |

Some other Investigation opportunities may include the use of quadratic iterations.