

**MATHEMATICS DEPARTMENT 2018**

**Year: 11 SPECIALIST MATHEMATICS Course: AEMAS (Unit 1 and Unit 2)**

**Textbook: Maths Specialist Unit 1 & 2 (Sadler) Revision Series: Maths Specialist Unit 1 & 2 (O.T. Lee)**

**SEMESTER 1 (Unit 1)**

**Term 1 2018**

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| **Term**  **1** | | **Week**  **commencing** | | **Syll ref** | **Topic** | **Chapter/Topic** | **Assess- ments** |
| **Topic 1.1: Combinatorics (and parts of Topic 1.3 Geometry)** | | | | | | | |
| **The nature of proof & The pigeon-hole Principle** | | | | | | | |
| 1 | | 29 Jan | | 1.1.6  1.3.1  1.3.2  1.3.3  1.3.4  1.3.5 | * solve problems and prove results using the pigeon-hole principle * use implication, converse, equivalence, negation, inverse, contrapositive * use proof by contradiction * use the symbols for implication (⇒), equivalence (⇔) * use the quantifiers ‘for all’ and ‘there exists’ * use examples and counter-examples | **Chapter 1**  *OTL 4* |  |
| **Permutations (ordered arrangements)** | | | | | | | |
| 2 | | 5 Feb | | 1.1.1  1.1.2  1.1.3  1.1.4 | * solve problems involving permutations * use the multiplication and addition principle * use factorial notation and * solve problems involving permutations involving restrictions with or without repeated objects | **Chapter 2**  *OTL 1, 2, 3* |  |
| **The inclusion-exclusion principle for the union of two & three sets** | | | | | | | |
| 3 | | 12 Feb | | 1.1.5 | * determine and use the formulas for finding the number of elements in the union of two and three sets | **Chapter 2**  *OTL 1, 2, 3* |  |
| **Combinations (unordered selections)** | | | | | | | |
| 4 | | 19 Feb | | 1.1.7  1.1.8  1.1.9 | * solve problems involving combinations * use the notation or * derive and use associated simple identities associated with Pascal’s triangle | **Chapter 2**  *OTL 1, 2, 3* | **Test 1 (5%)** |
| **Topic 1.2: Vectors in the plane** | | | | | | | |
| **Representing vectors in the plane by directed line segments** | | | | | | | |
| 5 | | 26 Feb | 1.2.1  1.2.2 | | * examine examples of vectors, including displacement and velocity * define and use the magnitude and direction of a vector | **Chapter 3**  *OTL 5, 6, 7, 8* |  |
| 6 | | 5 March  Monday Labour Day | 1.2.3  1.2.4 | | * represent a scalar multiple of a vector * use the triangle and parallelogram rules to find the sum and difference of two vectors | **Chapter 3**  *OTL 5, 6, 7, 8* | **Inv 1 (6%)** |
| **Term**  **1** | **Week**  **commencing** | | **Syll ref** | | **Topic** | **Chapter/Topic** | **Assess- ments** |
| **Algebra of vectors in the plane & Circle properties, including proof and use** | | | | | | | |
| 7 | 12 March | | 1.2.5  1.2.6  1.2.7  1.2.8  1.2.9 | | * use ordered pair notation and column vector notation to represent a vector * define unit vectors and the perpendicular unit vectors and * express a vector in component form using the unit vectors and * examine and use addition and subtraction of vectors in component form * define and use multiplication of a vector by a scalar in component form | **Chapter 4**  *OTL 5, 6, 7, 8* |  |
| **Topic 1.3: Geometry (and parts of Topic 1.2: Vectors in the plane)** | | | | | | | |
| 8 | 19 March | | 1.3.6  1.3.7  1.3.8  1.3.9  1.3.10  1.3.11  1.3.12 | | * an angle in a semicircle is a right angle * the size of the angle at the centre subtended by an arc of a circle is twice the size of the angle at the circumference subtended by the same arc * angles at the circumference of a circle subtended by the same arc are equal * the opposite angles of a cyclic quadrilateral are supplementary * chords of equal length subtend equal angles at the centre, and conversely, chords subtending equal angles at the centre of a circle have the same length * the angle in the alternate segment theorem * when two chords of a circle intersect, the product of the lengths of the intervals on one chord equals the product of the lengths of the intervals on the other chord | **Chapter 5**  *OTL 16* |  |
| 9 | 26 March  Friday  Good Friday | | 1.3.13  1.3.14  1.3.15 | | * when a secant (meeting the circle at *A* and *B*) and a tangent (meeting the circle at *T)* are drawn to a circle from an external point *M*, the square of length of the tangent equals the product of the lengths to the circle on the secant (*AM* × *BM* = *TM*2) * suitable converses of some of the above results * solve problems determining unknown angles and lengths and prove further results using the results listed above | **Chapter 5**  *OTL 16* | **Test 2 (7%)** |
| 10 | 2 April  Monday  Easter Mon | | 1.2.14 | | * solve problems involving displacement, force and velocity involving the above concepts | **Chapter 6**  *OTL 9,10,11* |  |
| **Geometric vectors in the plane including proof and use** | | | | | | | |
| 11 | 9 April | | 1.3.16  1.3.17  1.3.18 | | * the diagonals of a parallelogram intersect at right angles if, and only if, it is a rhombus, * the midpoints of the sides of a quadrilateral join to form a parallelogram, * 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 | **Chapter 7**  *OTL 15* | **Inv 2**  **(7%)** |
| **END OF TERM 1** | | | | | | | |

**Term 2 2018**

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| **Term**  **2** | **Week**  **commencing** |  | **Topic** | **Reference:**  **Chapter/Topic** | **Assess-ment** |
| **Algebra of vectors in the plane** | | | | | |
| 1 | 30 April | 1.2.10  1.2.11 | * define and use scalar (dot) product * apply the scalar product to vectors expressed in component form | **Chapter 8**  *OTL 12, 13, 14* |  |
| 2 | 7 May | 1.2.12  1.2.13 | * examine properties of parallel and perpendicular vectors and determine if two vectors are parallel or perpendicular * define and use projection of vectors | **Chapter 8**  *OTL 12, 13, 14* |  |
| 3 | 14 May |  | Revision |  | **Test 3 (7%)** |
| 4 | 21 May |  | Revision |  |  |
| 5 | 28 May |  | **SEMESTER ONE EXAMINATION** |  |  |
| 6 | 4 June |  |  |  |

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| **SEMESTER 2 (Unit 2)** | | | | | |
| **Topic 2.1: Trigonometry** | | | | | |
| **MODULE 1: Compound angles & Compound angles & The basic trigonometric functions** | | | | | |
| 7 | 11 June | 2.1.5  2.1.3 | * prove and apply the Pythagorean identities * prove and apply the angle sum, difference, and double angle | **Chapter 9**  *OTL 17-24* | Mon West Australia Day |
| **MODULE 2: Trigonometric identities & The reciprocal functions, secant, cosecant and cotangent** | | | | | |
| 8 | 18 June | 2.1.7  2.1.4  2.1.6  2.1.8 | * convert sums *a*cos *x +b*sin*x* to *R*cos*(x±α)* or *R*sin*(x±α)* and apply these to sketch graphs; solve equations of the form *a*cos*x +b*sin*x=c* * define the reciprocal trigonometric functions; sketch their graphs and graph simple transformations of them * prove and apply the identities for products of sines and cosines expressed as sums and differences * prove and apply other trigonometric identities | **Chapter 9**  *OTL 17-24* |  |
| **The basic trigonometric functions & Applications of trigonometric functions to model periodic phenomena** | | | | | |
| 9 | 25 June | 2.1.1  2.1.2  2.1.9 | * determine all solutions of *f(a(x−b))=c* where *f* is one of sine, cosine or tangent * graph functions with rules of the form *y=f(a(x−b))*+c where *f* is one of sine, cosine, or tangent * model periodic motion using sine and cosine functions and understand the relevance of the period and amplitude of these functions in the model | **Chapter 9**  *OTL 17-24* | **Inv 3**  **(7%)** |

**Term 3 2018**

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| **Term 3** | **Week**  **commencing** |  | **Topic** | **Reference:**  **Chapter/Topic** | **Assess-ment** |
| **Topic 2.2: Matrices** | | | | | |
| **Matrix arithmetic** | | | | | |
| 1 | 16 July | 2.2.1  2.2.2  2.2.3 | * apply matrix definition and notation * define and use addition and subtraction of matrices, scalar multiplication, matrix multiplication, multiplicative identity, and inverse * calculate the determinant and inverse of 2 × 2 matrices and solve matrix equations of the form *AX* = *B*, where *A* is a 2 × 2 matrix and *X* and *B* are column vectors | **Chapter 10**  *OTL 25* | **Test 4 (7%)** |
| **Systems of linear equations** | | | | | |
| 2 | 23 July | 2.2.11 | * interpret the matrix form of a system of linear equations in two variables and use matrix algebra to solve a system of linear equations | **Chapter 10**  *OTL 26, 27* |  |
| **Transformations in the plane** | | | | | |
| 3 | 30 July | 2.2.4  2.2.5  2.2.6  2.2.7 | * examine translations and their representation as column vectors * define and use basic linear transformations: dilations of the form *(x,y) ->(λ1 x, λ2 y*), rotations about the origin and reflection in a line that passes through the origin and the representations of these transformations by 2 × 2 matrices * apply these transformations to points in the plane and geometric objects * define and use composition of linear transformations and the corresponding matrix products | **Chapter 11**  *OTL 28* |  |
| 4 | 6 Aug | 2.2.8  2.2.9  2.2.10 | * define and use inverses of linear transformations and the relationship with the matrix inverse * examine the relationship between the determinant and the effect of a linear transformation on area * establish geometric results by matrix multiplications; for example: show that the combined effect of 2 reflections is a rotation | **Chapter 11**  *OTL 28* |  |
| **Topic 2.3: Real and complex numbers** | | | | | |
| **Proofs involving numbers & Rational and irrational numbers** | | | | | |
| 5 | 13 Aug | 2.3.1  2.3.2  2.3.3 | * prove simple results involving numbers * express rational numbers as terminating or eventually recurring decimals and vice versa * prove irrationality by contradiction for numbers such as | **Chapter 12**  *OTL 30* | **Test 5 (7%)** |
| **An introduction to proof by mathematical induction** | | | | | |
| 6 | 20 Aug | 2.3.4  2.3.5  2.3.6 | * develop the nature of inductive proof, including the ‘initial statement’ and inductive step * prove results for sums, such as  for any positive integer *n* * prove divisibility results, such as  is divisible by 5 for any positive integer *n* | **Chapter 12**  *OTL 30* |  |
| **Complex numbers** | | | | | |
| 7 | 27 Aug | 2.3.7  2.3.8  2.3.9  2.3.10 | * define the imaginary number *i* as a root of the equation x2=-1 * represent complex numbers in the rectangular form; *a* + *bi* where *a* and *b* are the real and imaginary parts * determine and use complex conjugates * perform complex number arithmetic: addition, subtraction, multiplication and division | **Chapter 13**  *OTL 29* |  |
| **The complex plane** | | | | | |
| 8 | 3 Sep | 2.3.11  2.3.12  2.3.13 | * consider complex numbers as points in a plane, with real and imaginary parts, as Cartesian coordinates * examine addition of complex numbers as vector addition in the complex plane * develop and use the concept of complex conjugates and their location in the complex plane | **Chapter 13**  *OTL 29* |  |
| **Roots of equations** | | | | | |
| 9 | 10 Sept | 2.3.14  2.3.15  2.3.16 | * use the general solution of real quadratic equations * determine complex conjugate solutions of real quadratic equations * determine linear factors of real quadratic polynomials | **Chapter 13**  *OTL 29* |  |
| 10 | 17 Sept |  | Revision |  | **Test 6(7%)** |
| **Term 4** | **Week**  **commencing** |  | **Topic** | **Reference:**  **Chapter/Topic** | **Assess-ment** |
| 1 | 8 Oct |  | Revision |  |  |
| 2 | 15 Oct |  | **SEMESTER TWO EXAMINATIONS** |  |  |
| 3 | 22 Oct |  | **SEMESTER TWO EXAMINATIONS** |  |  |
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**Mathematics Specialist: Assessment Outline: Year 11, 2018**

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| **Item** | **Type** | **Topic** | **Year weighting** | **Approximate timing** |
| Test 1 | Response | Combinatronics & Geometry  1.3.1-1.3.5, 1.1.1-1.1.9 | 5% | Term 1, Week 4 |
| Investigation 1 | Investigation | Combinatonics | 6% | Term 1, Week 6 |
| Test 2 | Response | Vectors & Geometry  1.2.1-1.2.9, 1.3.6-1.3.15 | 7% | Term 1, Week 9 |
| Investigation 2 | Investigation | Vectors/Geometry | 7% | Term 1, Week 11 |
| Test 3 | Response | Geometry & Vectors  1.2.10-1.2.14, 1.3.16-1.3.18 | 7% | Term 2, Week 3 |
| Semester 1 Examination | Examination | Unit 1 | 16% | Term 2, Week 5/6 |
|  |  | **Totals** | **48%** |  |
| Investigation 3 | Investigation | Trigonometry | 7% | Term 2, Week 9 |
| Test 4 | Response | Trigonometry  2.1.1-2.1.9 | 7% | Term 3, Week 1 |
| Test 5 | Response | Matrices  2.2.1-2.2.10 | 7% | Term 3, Week 5 |
| Test 6 | Response | Real and Complex numbers  2.3.1-2.3.16 | 7% | Term 3, Week 10 |
| Semester 2 Examination | Examination | Unit 1 & 2 | 24% | Term 4, Week 2/3 |
|  |  | **Totals** | **52%** |  |

**Types: Relative to time allocation**

Response 40% 1. Combinatorics 10% 4.Trigonometry 15%

Investigation 20% 2. Vectors 20% 5. Matrices 17%

Examination 40% 3. Geometry 20% 6. Real and Complex nos. 18%