Course Outline -2019

Mathematics Methods – ATAR Year 11

Units 1 and 2

This course outline assumes an allocation of 4 hours contact time per week for the course. The time allocated to the topics covered within this course outline is given as a suggestion. Teachers may wish to adjust the time allocation according to their student needs. Also the time of +1 in a given period is allocated to run an in-class assessment during the course contact time.

Mathematics Methods Units 1 and 2 will be studied concurrently as a unit pair though the content will be taught sequentially.

Text references: Sadler A.J, Mathematics Methods Units 1 & 2. Lee O.T, WACE Revision Series Mathematics Methods Year 11 Units 1 and 2

Resources: Casio ClassPad II Calculator, Casio FX-82AU Scientific Calculator

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| **Semester 1** | | | | |
| **Week** | | **Syllabus Unit 1** | **Textbook Reference** | **Assessment** |
| **Term 1** | | | | |
| **1 - 4** | | **Topic 1.2: Trigonometric Functions**  **Cosine and sine rules**  1.2.1 review sine, cosine and tangent as ratios of side lengths in right-angled triangles  1.2.2 understand the unit circle definition of *cos*𝜃*,sin*𝜃 *and tan*𝜃 and periodicity using degrees  1.2.3 examine the relationship between the angle of inclination of a line and the gradient of that line  1.2.4 establish and use the cosine and sine rules, including consideration of the ambiguous case and the formula *Area = 0.5bcsinA* for the area of a triangle  **Circular measure and radian measure**  1.2.5 define and use radian measure and understand its relationship with degree measure  1.2.6 calculate lengths of arcs and areas of sectors and segments in circles | **Sadler**  **Unit 1 Chapter 1**  **Unit 1 Chapter 2** | **Test 1 (5%)**  **Investigation 1 (10%)** |
| **5 – 8** | | **Topic 1.1: Functions and graphs**  **Functions**  1.1.23 understand the concept of a function as a mapping between sets and as a rule or a formula that defines one variable quantity in terms of another  1.1.24 use function notation; determine domain and range; recognise independent and dependentvariables  1.1.25 understand the concept of the graph of a function  **Lines and linear relationships**  1.1.1 determine the coordinates of the mid-point between two points  1.1.2 determine an end-point given the other end-point and the mid-point  1.1.3 examine examples of direct proportion and linearly related variables  1.1.4 recognise features of the graph of 𝑦𝑦 = 𝑚𝑚𝑥𝑥 + 𝑐𝑐, including its linear nature, its intercepts and its slope or gradient  1.1.5 determine the equation of a straight line given sufficient information; including parallel and perpendicular lines  1.1.6 solve linear equations, including those with algebraic fractions and variables on both sides | **Sadler**  **Unit 1 Chapter 3**  **Unit 1 Chapter 4** | **Test 2 (5%)** |
| **9 -10** | | **Quadratic relationships**  1.1.7 examine examples of quadratically related variables  1.1.8 recognise features of the graphs of 𝑦 = 𝑥2, 𝑦 = 𝑎(𝑥 − 𝑏)2 + 𝑐, and  𝑦 = 𝑎(𝑥 − 𝑏)(𝑥 − 𝑐), including their parabolic nature, turning points, axes of symmetry and intercepts  1.1.9 solve quadratic equations, including the use of quadratic formula and completing the square  1.1.10 determine the equation of a quadratic given sufficient information  1.1.11 determine turning points and zeros of quadratics and understand the role of the discriminant  1.1.12 recognise features of the graph of the general quadratic | **Sadler**  **Unit 1 Chapter 5**  **Unit 1 chapter 6** | **Test 3 (5%)** |
| **Term 2** | | | | |
| **1 – 2** | **Powers and polynomials**  1.1.15 recognise features of the graphs of 𝑦 = 𝑥𝑛 for 𝑛 ∈ 𝑵, 𝑛 = −1 and 𝑛 = ½, including shape, and behaviour as 𝑥 → ∞ and 𝑥 → −∞  1.1.16 identify the coefficients and the degree of a polynomial  1.1.17 expand quadratic and cubic polynomials from factors  1.1.18 recognise features and determine equations of the graphs of 𝑦 = 𝑥3,  𝑦 = 𝑎(𝑥 − 𝑏)3 + 𝑐 and 𝑦 =𝑘(𝑥 − 𝑎)(𝑥 − 𝑏)(𝑥 − 𝑐), including shape, intercepts and behaviour as 𝑥 → ∞ and 𝑥 → −∞  1.1.19 factorise cubic polynomials in cases where a linear factor is easily obtained  1.1.20 solve cubic equations using technology, and algebraically in cases where a linear factor is easily obtained  **Inverse proportion**  1.1.13 examine examples of inverse proportion  1.1.14 recognise features and determine equations of the graphs of 𝑦 = and 𝑦 = , including their hyperbolic shapes and their asymptotes  **Graphs of relations**  1.1.21 recognise features and determine equations of the graphs of 𝑥2 + 𝑦2 = 𝑟2 and  (𝑥 − 𝑎)2 + (𝑦 − 𝑏)2 = 𝑟2, including their circular shapes, their centres and their radii  1.1.22 recognise features of the graph of 𝑦2 = 𝑥, including its parabolic shape and its axis of symmetry | | **Sadler**  **Unit 1 Chapter 7** |  |
| **3 - 5** | **Topic 1.2: Trigonometric Functions**  **Trigonometric functions**  1.2.7 understand the unit circle definition of sin 𝜃𝜃, cos 𝜃𝜃 and tan 𝜃𝜃 and periodicity using radians  1.2.8 recognise the exact values of sin 𝜃, cos 𝜃 and tan 𝜃 at integer multiples of and  1.2.9 recognise the graphs of 𝑦 = sin 𝑥, 𝑦 = cos 𝑥 , and 𝑦 = tan 𝑥 on extended domains  1.2.10 examine amplitude changes and the graphs of 𝑦 = 𝑎 sin 𝑥 and 𝑦 = 𝑎 cos 𝑥  1.2.11 examine period changes and the graphs of 𝑦 = sin 𝑏, 𝑦 = cos 𝑏 and  𝑦 = tan 𝑏  1.2.12 examine phase changes and the graphs of 𝑦 = sin(𝑥 − 𝑐), 𝑦 = cos(𝑥 − 𝑐) and  𝑦 = tan (𝑥 − 𝑐)  1.2.13 examine the relationships and  1.2.14 prove and apply the angle sum and difference identities  1.2.15 identify contexts suitable for modelling by trigonometric functions and use them to solve practical problems  1.2.16 solve equations involving trigonometric functions using technology, and algebraically in simple cases | | **Sadler**  **Unit 1 Chapter 8** | **Test 4 (5%)** |
| **6** | **Unit 1 Revision** | | |  |
| **7** | **Exam** | | | **Exam**  **(15%)** |

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| **Semester 2** | | | | | | |
| **Week** | | **Syllabus Unit 1** | **Textbook Reference** | | **Assessment** | |
| **Term 2** | | | | | | |
| **8 - 10** | **Topic 1.3: Counting and probability**  **Language of events and sets**  1.3.6 review the concepts and language of outcomes, sample spaces, and events, as sets of outcomes  1.3.7 use set language and notation for events, including:  a. 𝐴 (or 𝐴’) for the complement of an event 𝐴  b. 𝐴∩𝐵 and 𝐴∪𝐵 for the intersection and union of events 𝐴 and 𝐵 respectively  c. 𝐴∩𝐵∩𝐶 and 𝐴∪𝐵∪𝐶 for the intersection and union of the three events 𝐴, 𝐵 and 𝐶 respectively  d. recognise mutually exclusive events.  1.3.8 use everyday occurrences to illustrate set descriptions and representations of events and set operations  **Review of the fundamentals of probability**  1.3.9 review probability as a measure of ‘the likelihood of occurrence’ of an event  1.3.10 review the probability scale: 0≤𝑃(𝐴)≤1 for each event 𝐴, with 𝑃(𝐴)=0 if 𝐴 is an impossibility and 𝑃(𝐴)=1 if 𝐴 is a certainty  1.3.11 review the rules: 𝑃()=1−𝑃(𝐴) and 𝑃(𝐴∪𝐵)=𝑃(𝐴)+𝑃(𝐵)−𝑃(𝐴∩𝐵)  1.3.12 use relative frequencies obtained from data as estimates of probabilities  **Conditional probability and independence**  1.3.13 understand the notion of a conditional probability and recognise and use language that indicates conditionality  1.3.14 use the notation 𝑃(𝐴|𝐵) and the formula 𝑃(𝐴∩𝐵)=𝑃(𝐴|𝐵)𝑃(𝐵)  1.3.15 understand the notion of independence of an event A from an event B, as defined by 𝑃(𝐴|𝐵)=𝑃(𝐴)  1.3.16 establish and use the formula 𝑃(𝐴∩𝐵)=𝑃(𝐴)𝑃(𝐵) for independent events 𝐴 and 𝐵, and recognise the symmetry of independence  1.3.17 use relative frequencies obtained from data as estimates of conditional probabilities and as indications of possible independence of events  **Combinations**  1.3.1 understand the notion of a combination as a set of 𝑟 objects taken from a set of 𝑛 distinct objects  1.3.2 use the notation and the formula for the number of combinations of 𝑟 objects taken from a set of 𝑛 distinct objects  1.3.3 expand (𝑥+𝑦)n for small positive integers 𝑛  1.3.4 recognise the numbers as binomial coefficients (as coefficients in the expansion of )  1.3.5 use Pascal’s triangle and its properties | | **Sadler**  **Unit 1 Chapter 9**  **Unit 1 Chapter 10** | | **Test 5 (7%)** |
| **Week** | **Syllabus Unit 2** | | **Textbook Reference** | | **Assessment** |
| **Term 3** | | | | | | |
| **1 - 2** | **2.1: Exponential functions**  **Indices and the index laws**  2.1.1 review indices (including fractional and negative indices) and the index laws  2.1.2 use radicals and convert to and from fractional indices  2.1.3 understand and use scientific notation and significant figures  **Exponential functions**  2.1.4 establish and use the algebraic properties of exponential functions  2.1.5 recognise the qualitative features of the graph of 𝑦=(𝑎>0), including asymptotes, and of its translations (𝑦 =+𝑏 and 𝑦 =)  2.1.6 identify contexts suitable for modelling by exponential functions and use them to solve practical problems  2.1.7 solve equations involving exponential functions using technology, and algebraically in simple cases | | **Sadler**  **Unit 2 Chapter 1**  **Unit 2 Chapter 2** | |  | |
| **3-4** | **Topic 2.2: Arithmetic and geometric sequences and series**  **Arithmetic sequences**  2.2.1 recognise and use the recursive definition of an arithmetic sequence:    2.2.2 develop and use the formula for the general term of an arithmetic sequence and recognise its linear nature  2.2.3 use arithmetic sequences in contexts involving discrete linear growth or decay, such as simple interest  2.2.4 establish and use the formula for the sum of the first 𝑛𝑛 terms of an arithmetic sequence  **Geometric sequences**  2.2.5 recognise and use the recursive definition of a geometric sequence:    2.2.6 develop and use the formula for the general term of a geometric sequence and recognise its exponential nature  2.2.7 understand the limiting behaviour as 𝑛 → ∞ of the terms 𝑡𝑛 in a geometric sequence and its dependence on the value of the common ratio 𝑟  2.2.8 establish and use the formula for the sum of the first 𝑛 terms of a geometric sequence  2.2.9 use geometric sequences in contexts involving geometric growth or decay, such as compound interest | | **Sadler**  **Unit 2 Chapter 3**  **Unit 2 Chapter 4** | | **Test 6 (5%)** | |
| **5 - 8** | **Topic 2.3: Introduction to differential calculus**  **Rates of change**  2.3.1 interpret the difference quotient as the average rate of change of a function 𝑓  2.3.2 use the Leibniz notation 𝛿 and 𝛿 for changes or increments in the variables 𝑥 and 𝑦  2.3.3 use the notation for the difference quotient where 𝑦 =𝑓(𝑥)  2.3.4 interpret the ratios and as the slope or gradient of a chord or secant of the graph of 𝑦=𝑓(𝑥)  **The concept of the derivative**  2.3.5 examine the behaviour of the difference quotient as ℎ → 0 as an informal introduction to the concept of a limit  2.3.6 define the derivative as  2.3.7 use the Leibniz notation for the derivative: and the correspondence where  2.3.8 interpret the derivative as the instantaneous rate of change  2.3.9 interpret the derivative as the slope or gradient of a tangent line of the graph of 𝑦 =𝑓(𝑥)  **Computation of derivatives**  2.3.10 estimate numerically the value of a derivative for simple power functions  2.3.11 examine examples of variable rates of change of non-linear functions  2.3.12 establish the formula for non-negative integers 𝑛 expanding (𝑥+ℎ)n or by factorising (𝑥+ℎ)n− 𝑥n  **Properties of derivatives**  2.3.13 understand the concept of the derivative as a function  2.3.14 identify and use linearity properties of the derivative  2.3.15 calculate derivatives of polynomials | | **Sadler**  **Unit 2 Chapter 5** | | **Investigation 2 (10%)** | |
| **9 - 10** | **Applications of derivatives**  2.3.16 determine instantaneous rates of change  2.3.17 determine the slope of a tangent and the equation of the tangent  2.3.18 construct and interpret position-time graphs with velocity as the slope of the tangent  2.3.19 recognise velocity as the first derivative of displacement with respect to time  2.3.20 sketch curves associated with simple polynomials, determine stationary points, and local and global maxima and minima, and examine behaviour as 𝑥→∞ and 𝑥→−∞  2.3.21 solve optimisation problems arising in a variety of contexts involving polynomials on finite interval domains | | **Sadler**  **Unit 2 Chapter 6** | |  | |
| **Term 4** | | | | | | |
| **1 - 2** | **Anti-derivatives**  2.3.22 calculate anti-derivatives of polynomial functions  2.3.19 recognise velocity as the first derivative of displacement with respect to time | | | **Sadler**  **Unit 2 Chapter 7**  **Unit 2 Chapter 8** | **Test 7 (8%)** | |
| **3 -4** | **Unit 1 and 2 Revision** | | | |  | |
| **5** | **Exam** | | | | **Exam**  **(25%)** |