COURSE OUTLINE
MATHEMATICS METHODS – ATAR YEAR 11: 2022
UNIT 1 & UNIT 2

Term	Week	Topic and Key Teaching Points	Syllabus Content	References	Assessments
1	1	**Counting and Probability** Combinations	1.3.1 Understand the notion of a combination as an ordered set of r objects taken from a set of n distinct objects 1.3.2 Use the notation $\binom{n}{r}$ and the formula $\binom{n}{r} = \frac{n!}{r!(n-r)!}$ 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 $\binom{n}{r}$ as binomial coefficients (as coefficients in the expansion of $(x+y)^n$) 1.3.5 Use Pascal's triangle and its properties	**Sadler U1 Text – ch10**	
1	2	**Trigonometric Functions** Cosine and Sine Rule	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 $cos\theta$, $sin\theta$ and $tan\theta$ 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 sine and cosine rules, including consideration of the ambiguous case, and the formula $Area = \frac{1}{2}bcsinA$ for the area of a triangle	**Sadler U1 Text – ch1**	
1	3	**Trigonometric Functions** 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 U1 Text – ch2**	**Investigation 1**
1	4	**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	**Sadler U1 Text – ch3**	**Test 1 week 4**

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			1.1.24 Use function notation, determine domain and range, recognise independent and dependent variables 1.1.25 Understand the concept of the graph of a function		
1	5 (2h)	**Functions and Graphs** Lines and linear relationships	1.1.1 Determine the coordinates of the midpoint of 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 $y = mx + c$, 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 U1 Text – ch4**	
1	5-6	**Functions and Graphs** Review of Quadratic Relationships	1.1.7 Examine examples of quadratically related variables 1.1.8 Recognise features of the graphs of $y = x^2$, $y = a(x-b)^2 + c$, 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 the 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 $y = ax^2 + bx + c$	**Sadler U1 Text – ch5 - 6**	**Test 2, week 7**

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1	7-10	**Functions and Graphs** Powers and Polynomials	1.1.15 Recognise features of the graphs of $y = x^n$ for $n \in N, n = -1$ and $n = ½$, including shape, and behaviour as $x \to \infty$ and $x \to -\infty$ 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 $y = x^3$, $y = a(x-b)^3 + c$ and $y = k(x-a)(x-b)(x-c)$, including shape, intercepts and behaviour as $x \to \infty$ and $x \to -\infty$ 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. 1.1.26 Examine translations and the graphs of $y = f(x) + a$ and $y = f(x-b)$ 1.1.27 Examine dilations and the graphs of $y = cf(x)$ and $y = f(dx)$ 1.1.28 Recognise the distinction between functions and relations, and apply the vertical line test.	**Sadler U1 Text – ch7**	
		Inverse Proportion	1.1.13 Examine examples of inverse proportion 1.1.14 Recognise features and determine equations of the graphs of $y = \frac{1}{x}$ and $y = \frac{a}{x-b}$, including their hyperbolic shapes, and their asymptotes.	**Sadler U1 Text – ch7**	
		Graphs of Relations	1.1.21 Recognise features of the graphs of $x^2 + y^2 = r^2$ and $(x-a)^2 + (y-b)^2 = r^2$, including their circular shapes, their centres and their radii 1.1.22 Recognise features of the graph of $y^2 = x$ including its parabolic shape and its axis of symmetry	**Sadler U1 Text – ch7**	

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2	1-2	**Trigonometric Functions** Trigonometric Functions	1.2.7 Understand the unit circle definition of $cos\theta$, $sin\theta$ and $tan\theta$ and periodicity using radians 1.2.8 Recognise the exact values of $sin\theta$, $cos\theta$ and $tan\theta$ at integer multiples of $\frac{\pi}{6}$ and $\frac{\pi}{4}$ 1.2.9 Recognise the graphs of $y = sinx$, $y = cosx$, and $y = tanx$ on extended domains 1.2.10 Examine amplitude changes and the graphs of $y = asinx$ and $y = acosx$ 1.2.11 Examine period changes and the graphs of $y = sinbx$, $y = cosbx$, and $y = tan\, bx$ 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 $sin(x + \frac{\pi}{2}) = cosx$ and $cos(x - \frac{\pi}{2}) = sinx$ 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 U1 Text – ch8**	
2	3-5	**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. $A \cap B$ and $A \cup B$ for the intersection and union of events A and B, respectively	**Sadler U1 Text – ch9**	

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		Review of the Fundamentals of Probability Conditional Probability and Independence	c. $A \cap B \cap C$ and $A \cup B \cup C$ 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. 1.3.9 Review probability as a measure of 'the likelihood of occurrence' of an event 1.3.10 Review the probability scale: $0 \leq P(A) \leq 1$ 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: $P(\bar{A}) = 1 - P(A)$ and $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ 1.3.12 Use relative frequencies obtained from data as point estimates of probabilities. 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 $P(A \cap B) = P(A\|B) \cdot P(B)$ 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 $P(A \cap B) = P(A) \cdot P(B)$ for independent events A and B, and recognise the symmetry of independence 1.3.17 Use relative frequencies obtained from data as point estimates of conditional probabilities and as indications of possible independence of events.	**Sadler U1 Text – ch9**	**Test 3 week 5**
2	**6**	**Revision**			
2	**7-8**	**Year 11 ATAR Semester 1 Exams Unit 1**			

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2	10 (4h)	**Exponentials Functions** Indices and The Index Laws	2.1.1 Review indices (including fractional 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	**Sadler U2 Text – ch1**	
3	1-2	**Exponential Functions** 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 $y = a^x$ $(a > 0)$ including asymptotes, and of its translations ($y = a^x + b$ and $y = a^{x-c}$) 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 U2 Text – ch2**	**Test 4 week 2**
3	3-4	**Arithmetic and Geometric Sequences and Series** Arithmetic Sequences	2.2.1 Recognise and use the recursive definition of an arithmetic sequence: $t_{n+1} = t_n + d$ 2.2.2 Develop and use the formula $t_n = t_1 + (n-1)d$ 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 n terms of an arithmetic sequence	**Sadler U2 Text – ch3 and 4**	
3	5-6	**Arithmetic and Geometric Sequences and Series** Geometric Sequences	2.2.5 Recognise and use the recursive definition of a geometric sequence: $t_{n+1} = t_n r$ 2.2.6 Develop and use the formula $t_n = t_1 r_{n-1}$ for the general term of a geometric sequence and recognise its exponential nature	**Sadler U2 Text – ch3 and 4**	

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			2.2.7 Understand the limiting behaviour as $n \to \infty$ of the terms t_n in a geometric sequence and its dependence on the value of the common ratio r 2.2.8 Establish and use the formula $S_n = t_1 \frac{r^n-1}{r-1}$ 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		
3	7-9	**Introduction to Differential Calculus** Rates of Change The concept of the derivative	2.3.1 Interpret the difference quotient $\frac{f(x+h)-f(x)}{h}$ as the average rate of change of a function f 2.3.2 Use the Leibniz notation δx and δy for changes or increments in the variables x and y 2.3.3 Use the notation $\frac{\delta y}{\delta x}$ for the difference quotient $\frac{f(x+h)-f(x)}{h}$ where $y=f(x)$ 2.3.4 Interpret the ratios $\frac{f(x+h)-f(x)}{h}$ and $\frac{\delta y}{\delta x}$ as the slope or gradient of a chord or secant of the graph of $y = f(x)$. 2.3.5 Examine the behaviour of the difference quotient $\frac{f(x+h)-f(x)}{h}$ as $h \to 0$ as an informal introduction to the concept of a limit 2.3.6 Define the derivative $f'(x)$ as $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ 2.3.7 Use the Leibniz notation for the derivative: $\frac{dy}{dx} = \lim_{\delta x\to 0} \frac{\delta y}{\delta x}$ and the correspondence $\frac{dy}{dx} = f'(x)$ where $y = f(x)$ 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 $y = f(x)$	**Sadler U2 Text – ch5** **Sadler U2 Text – ch5**	**Test 5 week 7** **Investigation 2**

Term	Week	Topic and Key Teaching Points	Syllabus Content	References	Assessments
		Computation of the derivative	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 $\frac{d}{dx}(x^n) = nx^{n-1}$ for positive integers n by expanding $(x+h)^n$ or by factorising $(x+h)^n - x^n$	**Sadler U2 Text – ch5**	
		Properties of Derivatives	2.3.13 Understand the concept of the derivative as a function 2.3.14 Recognise and use linearity properties of the derivative 2.3.15 Calculate derivatives of polynomials	**Sadler U2 Text – ch5**	
3 4	10 1	**Introduction to Differential Calculus** Applications of the Derivative	2.3.16 Determine instantaneous rates of change 2.3.17 Determine the slope of a tangent and the equation of the tangent 2.3.20 Sketch curves associated with simple polynomials; determine stationary points, and local and global maxima and minima; and examine behaviour as $x \to \infty$ and $x \to -\infty$ 2.3.21 Solve optimisation problems arising in a variety of contexts involving polynomials on finite interval domains	**Sadler U2 Text – ch6**	
4	2	**Introduction to Differential Calculus** Anti-Derivatives	2.3.22 Calculate anti-derivatives of polynomial functions	**Sadler U2 Text – ch7**	
4	3-4	**Introduction to Differential Calculus** Applications of Derivatives	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	**Sadler U2 Text – ch8**	**Test 6 week 4**
4	5	**Revision for Exams**			
4	6-7	**Year 11 ATAR Semester 2 Exams**	**Units 1 and 2**		