Course Outline

Mathematics Unit 1

Week	Topics	Outcomes Students will be able to …	References Hand-outs Textbook Exercise	Assessment
1	Defining Functions, domain and range	Navigate LMS proficiently	Introduction Presentation Scavenger Hunt	Diagnostic (used as formative assessment)
		Complete diagnostic test (40 minutes)		
		Classify numbers in the correct number set Use set notation to describe numbers Apply set notation correctly		
		Identify functions Find the domain and range of a relation in equation and graphical form using set and interval notation Define a function fully using domain and co-domain	Domain and Range Worksheet	
2	Functions: Quadratics, Transforma-tions, Polynomial Division, Cubics	Use discriminant to determine the number of intercepts Sketch parabolas showing all key features Formulate the equation of a function from its graph Complete the square to find the turning point	Quadratic Graphs 1E	
		Apply transformations to the parabola Use correct mathematical terminology for transformations	The Parabola Turning Point Form 2A	
		Use long division or other means to factorise polynomials Identify divisor, dividend, and remainder Apply remainder and factor theorem	Division of Polynomials 1C Synthetic Division handout	
		Apply polynomial division to factorise cubic functions and find x-intercepts Sketch cubic graphs showing all key features	Cubic Graphs 1F	
3	Functions: Cubics in point	Apply transformations and the language of transformations to cubics	Cubic Function 2B	Progress Test

	of inflection form, transforma-tions, applications	Sketch quartics using the intercept method Match quartic graphs and their equation	Quartic Graphs 1G	
		Apply knowledge of parabolas, cubics, and quartics in real world context Create mathematical models to align with real-life application	Applications Worksheet	
		Communicate and justify mathematically a persuasive argument with real-life scenario		
4	Functions: Applications, Hyperbolas, Square root functions	Apply knowledge of parabolas, cubics, and quartics in real world context Create mathematical models for real life applications		Language Task
		Graph hyperbolas labelling all key features including the asymptotes Find the equation of a hyperbola given a graph Describe and apply transformations to the basic hyperbola	The Hyperbola 2C	
		Graph square root functions labelling all key features including the endpoint Find the equation of a square root given a graph Describe and apply transformations to the basic square root function	The Square Root Function 2E	
		Define a piece-wise function with correct domain and rules Sketch a piece-wise function with clear endpoints Use a piece-wise function to define a real-life scenario		
5	Inverses	Reflect a function across the line y=x to find its inverse Find the equation of a functions inverse Understand the relationship between domain and range of a function and its inverse	Functions and their Inverses 5B	
		Reflect a function across the line y=x to find its inverse Find the equation of a functions inverse Understand the relationship between domain and range of a function and its inverse	Inverse Functions 5C	

		Restrict domain to create a one-to-one function Use correct notation for defining a function and its inverse	Restricting Functions 5D	
		Consolidate mathematical concepts and apply knowledge across a breadth of topics	Chapter 1, 2, 5 Review questions	
6	Index and logarithmic laws, indicial equations, logarithmic equations			Power Functions Test
		Apply index and logarithmic laws with varying degrees of difficulty	Index Laws 3A Logarithm Laws 3B	
		Solve indicial equations	Indicial Equations 3C	
		Solve logarithmic equations	Logarithmic Equations 3D	
7	Euler's number and ln, Exponential and Logarithmic modelling, Exponential and Logarithmic graphs	Understand the value of *e* and the natural log. Understand the derivation (do not need to prove) the value of *e* and its appearance in the real world Solve indicial equations with *e* Solve logarithmic equations with ln.	Exponential Equations with *e* 3E Equations with ln 3F	
		Use mathematical knowledge to solve problems in 'real world' context Apply knowledge of exponential functions to investments and population growth	Exponential and Logarithmic Modelling 3H	
		Graph exponential functions labelling key features Graph exponential functions with base *e*	Exponential Graphs (including *e*) 4A, 4C	
		Graph logarithmic functions labelling key features Graph natural log functions	Logarithmic Graphs (including ln) 4B, 4D	
8	Applications of exponential and logarithmic functions, radians, unit	Use mathematical knowledge to solve problems in 'real world' context	Applications 4G	
		Convert degrees to radians Understand parts of the unit circle and its significance with trigonometry	Radians and the Unit Circle 6A	

	circle, symmetry, Trig Equations	State exact values without the use of a calculator Apply knowledge of symmetry to find trig ratios related to the exact values	Symmetry and Exact Values 6B	
		Apply knowledge of symmetry and exact values to solve trigonometric equations	Trigonometric Equations 6C	
9	Sine and Cosine graphs and applications	Correctly use mathematical terminology for describing trigonometric graphs Graph sine and cosine graphs applying transformations	Trigonometric Graphs 6D	
		Find the equation of a trigonometric function when given its graph. (Tangent graphs not included)	Finding the Equations of a Trig Graph 6F	
		Identify phenomena that are explained using trigonometric modelling Use mathematical knowledge to solve trigonometric problems in 'real world' context	Trigonometric Modelling 6G	
		Consolidate mathematical concepts and apply knowledge across a breadth of topics	Chapter 3, 4, & 6 Review Questions	
10	Rates of Change, graphs and their derivatives			Trig., Exponent, and Logarithms Test
		Distinguish between constant, average, and instantaneous rates of change Use key features of a graph to sketch its gradient function	Gradient and Rates of Change 7A	
		State the domain of a gradient function Match functions with their gradient functions.		
		Understand the derivation of the derivative rule using first principles (do not need to apply use of first principles). Calculate the derivative of a power function by rule Calculate the instantaneous rate of change at a point Understand the various symbols and mathematical terminology ascribed to the derivative	The Derivative of x^n 7C	

11	Derivative by rule, chain rule, derivative of e^x , ln(x), and trig functions	Apply the chain rule to find the derivative function	The Chain Rule 7D	
		Apply derivative rules for e^x and ln(x)	The derivative of e^x and ln(x) 7E & 7F	
		Apply derivative rules for trigonometric functions	The derivative of Trig Functions 7G	
		Apply product and quotient rule to derivative problems	Product and Quotient Rule 7H & 7I	
12	Product, quotient rule, derivative tables	Apply all differentiation rules to mixed problems	Mix Problems with Derivatives 7J	
		Apply knowledge of derivatives to sketching curves Find stationary points using derivatives Use a derivative table to verify nature of stationary points	Sketching Curves 8A	
		Use the gradient function to solve optimisation problems	8C	
		Use the gradient function to solve optimisation problems when function is not given.	8D	
13	Consolidation of Derivatives and Functions	Consolidate mathematical concepts and apply knowledge across a breadth of topics	Chapter 7 & 8 Review Questions Take-home Practice Test	Group Task (Week 13 and 14 can swap. This may be decided by provider.)
		Recall knowledge and technical skills for functions and derivatives Apply knowledge to an unfamiliar context Use technology effectively Communicate mathematical ideas, interpret results, and validate answers Use team work and communication skills in group setting		
14	Exam Revision	REVISION		