Year 13 Pure Maths Curriculum Summary

– Y13 Pure Mathematics

When?	Topic	Knowledge	Unit Assessments
HALF TERM 1	**Algebraic methods**	● Use proof by contradiction to prove true statements ● Multiply and divide two or more algebraic fractions ● Add or subtract two or more algebraic factions ● Convert an expression with linear factors in the denominator into partial fractions ● Convert an expression with repeated linear factors in the denominator into partial fractions ● Divide algebraic expressions ● Convert an improper fraction into partial fraction form	• proof by contradiction • add, subtract, times, divide algebraic fractions • partial fractions with linear factors, repeated factors in denominator • algebraic long division • improper fractions
	Functions and graphs	● Understand and use the modulus function ● Understand mappings and functions, and use domain and range ● combine two or more functions to make a composite function ● know how to find the inverse of a function graphically and algebraically ● Sketch the graphs of the modulus function $y = \|f(x)\|$ and $y = f(\|x\|)$ ● Apply a combination of two (or more) transformations to the same curve ● Transform the modulus function	• modulus function • mappings and functions • domain and range • composite function • inverse of a function • graphs of the modulus function $y = \|f(x)\|$ and $y = f(\|x\|)$ • two (or more) transformations to the same curve

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	Sequences and series	● Find the nth term of an arithmetic sequence ● Prove and use the formula for the sum of the first n terms of an arithmetic series ● Find the nth term of a geometric sequence ● Prove and use the formula for the sum of a finite geometric series ● Prove and use the formula for the sum to infinity of a convergent geometric series ● Use sigma notation to describe series ● Generate sequences from recurrence relations ● Model real-life situations with sequences and series	• N-th term of an arithmetic and geometric • Sn • Sum to infinity • sigma notation • recurrence relations • Model
HALF TERM 2	**Binomial expansion**	● Expand $(1+x)^n$ for any rational constant n and determine the range of values of x for which the expression is valid ● Expand $(a+bx)^n$ for any rational constant n and determine the range of values of x for which the expression is valid ● Use partial fractions to expand fractional expressions	• $(1+x)^n$ • $(a+bx)^n$ • Use partial fractions
	Radians	● Convert between degrees and radians and apply this to trigonometric graphs and their transformations ● Know exact values of angles measured in radians ● Find an arc length using radians ● Find areas of sectors and segments using radians ● Solve trigonometric equations in radians ● Use approximate trigonometric values when θ is small	• Use radians, with trig graphs and their transformations • Exact values eg 30 = $\frac{\pi}{6}$ • Arc length • Sector area • Solve trig equations with radians • Trig approximations when Θ is small

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	Trigonometric functions	● Understand the definition of secant, cosecant and cotangent and their relationship to cosine, sine and tangent ● Understand the graphs of secant, cosecant and cotangent and their domain and range ● Simplify expressions, prove simple identities and solve equations involving secant, cosecant and cotangent ● Prove and use $\sec^2 x \equiv 1 + \tan^2 x$ and $\operatorname{cosec}^2 x \equiv 1 + \cot^2 x$ ● understand and use inverse trigonometric functions and their domain and ranges	• Use sec, cosec, cot, and their graphs • Prove identities with sec, cosec, cot • Prove and use $\sec^2 x \equiv 1 + \tan^2 x$ and $\operatorname{cosec}^2 x \equiv 1 + \cot^2 x$ • inverse trigonometric functions and their domain and ranges
	Trigonometry and modelling	● Prove and use the addition formulae ● understand and use the double-angle formulae ● Solve trigonometric equations using the double-angle and addition formulae ● Write expressions of the form $a\cos\theta \pm b\sin\theta$ in the form $R\cos(\theta \pm a)$ or $R\sin(\theta \pm a)$ ● Prove trigonometric identities using a variety of identities ● Use trigonometric functions to model real-life situations	• addition formulae • double-angle formulae • Solve trigonometric equations using the double-angle and addition formulae • $R\cos(\theta \pm a)$, $R\sin(\theta \pm a)$ • Prove trigonometric identities • Use trigonometric functions to model real-life situations
HALF TERM 3	**Parametric equations**	● Convert parametric equations into Cartesian form by substitution ● Convert parametric equations into Cartesian form using trigonometric identities ● Understand and use parametric equations of curves and sketch parametric curves ● Solve coordinate geometry problems involving parametric equations ● Use parametric equations in modelling in a variety of contexts	• parametric equations into Cartesian • parametric equations into Cartesian form using trigonometric identities • use parametric equations of curves • sketch parametric curves • Solve coordinate geometry problems • modelling

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	Differentiation	● Differentiate trigonometric functions ● Differentiate exponentials and logarithms ● Differentiate functions using the chain, product and quotient rules ● Differentiate parametric equations ● Differentiate functions which are defined implicitly ● Use the second derivative to describe the behaviour of a function ● Solve problems involving connected rates of change and construct simple differential equations	Differentiation of/using • trigonometric functions • exponentials and logarithms • using the chain, product and quotient rules • parametric equations • implicit • second derivative connected rates of change differential equations
HALF TERM 4	**Numerical methods**	● Locate roots of $f(x) = 0$ by considering changes of sign ● Use iteration to find an approximation to the root of the equation $f(x) = 0$ ● Use the Newton-Raphson procedure to find approximations of the solutions of equations in the form $f(x) = 0$ ● Use numerical methods to solve problems in context	• Locate roots • Iteration • Newton Raphson • Numerical methods •
	Integration	● Integrate standard mathematical functions including trigonometric and exponential functions and use the reverse of the chain rule to integrate functions in the form of $f(ax + b)$ ● Use trigonometric identities in integration ● Use the reverse of the chain rule to integrate more complex functions ● Integrate functions by making a substitution, using integration by parts and using partial fractions ● Use integration to find the area under a curve ● Use the trapezium rule to approximate the area under a curve ● Solve simple differential equations and model real-life situations with differential equations	Integrate: • Trig functions • Exponentials • Using reverse chain rule • Using trig identities • By substitution • By parts • Using partial fractions • To find area under a curve Trapezium rule Solve differential equations, and model

When?	Topic	Knowledge	Unit Assessments
	Vectors	● Understand 3D Cartesian coordinates ● Use vectors in three dimensions ● Use vectors to solve geometric problems ● Model 3D motion in mechanics with vectors	• 3D coordinates • Vectors in 3D • Solve problems with vectors • 3D motion