THE ABBEY SCHOOL
A BUSINESS & ENTERPRISE ACADEMY

Mathematics

Year 13

A Level Pure Mathematics Scheme of Learning 2023 - 2024

Subject leader: K Ellender

Topics by term	Topic overview for 13 – A Level maths					
	Term 1	**Term 2**	**Term 3**	**Term 4**	**Term 5**	**Term 6**
	1. Algebraic Methods **1.1.** Proof By Contradiction 1.2. Algebraic Fractions 1.3. Partial Fractions 1.4. Repeated Factors 1.5. Algebraic Division **2. Functions and Graphs** 2.1. The Modulus Function 2.2. Functions and Mappings 2.3. Composite Functions 2.4. Inverse Functions 2.5. y=|f(x)| and y=f(|x|) 2.6. Combining Transformations 2.7. Solving Modulus Problems **3. Sequences and Series** 3.1. Arithmetic Sequences 3.2. Arithmetic Series 3.3. Geometric Sequences 3.4. Geometric Series 3.5. Sum to Infinity 3.6. Sigma Notation 3.7. Recurrence Relations 3.8. Modelling with Series **4. Binomial Expansion** 4.1. Expanding 〖(1+x)〗^n 4.2. Expanding 〖(a+bx)〗^n 4.3. Using Partial Fractions	**5. Radians** 5.1. Radian Measure 5.2. Arc Length 5.3. Areas of Sectors and Segments 5.4. Solving Trigonometric Equations 5.5. Small Angle Approximations **6. Trigonometric Functions** 6.1. Secant, Cosecant and Cotangent 6.2. Graphs of sec, cosec, and cot 6.3. Using sec, cosec and cot 6.4. Trigonometric Identities 6.5. Inverse Trigonometric Identities **7. Trigonometry and Modelling** 7.1. Addition Formulae 7.2. Using the Angle Addition Formulae 7.3. Double-Angle Formulae 7.4. Solving Trigonometric Equations 7.5. Simplifying a cos(x)±b sin(x) 7.6. Proving Trigonometric Identities 7.7. Modelling with Trigonometric Functions.	**8. Parametric Equations** 8.1. Parametric Equations 8.2. Using Trigonometric Identities 8.3. Curve Sketching 8.4. Points of Intersection 8.5. Modelling with Parametric Equations **9. Differentiation** 9.1. Differentiating sinx and cosx 9.2. Differentiating exponentials and logarithms 9.3. The chain rule 9.4. The product rule 9.5. The quotient rule 9.6. Differentiating trigonometric functions 9.7. Parametric differentiation 9.8. Implicit differentiation 9.9. Using second derivatives 9.10. Rates of change	**10. Numerical Methods** 10.1. Locating roots 10.2. Iteration 10.3. The Newton-Raphson Method 10.4. Applications to Modelling **11. Integration** 11.1. Integrating Standard Functions 11.2. Integrating f(ax+b) 11.3. Using Trigonometric identities 11.4. Reverse Chain Rule 11.5. Integration by Substitution 11.6. Integration by parts 11.7. Partial Fractions 11.8. Finding areas 11.9. The trapezium rule 11.10. Solving differential equations 11.11. Modelling with differential equations **12. Vectors** 12.1. 3D Coordinates 12.2. Vectors in 3D 12.3. Solving Geometric Problems 12.4. Applications to Mechanics	**Revision**	**N/A**

Exam Board - Edexcel							
Spec References	**Big Questions**	**Topic area: Main Items**	**Outcomes**	**Key Terms and Concepts Literacy Numeracy**	**Assessment and homework tasks**	**Resources**	**Personal Development Curriculum links (SMSC, British Values, WPD)**
Term 1							
Algebraic Methods – Week 2-3							
	How do we build on our algebraic methods from year 12?	**1.1 Proof by contradiction** **1.2 Algebraic Fractions** **1.3 Partial Fractions** **1.4 Repeated Factors** **1.5 Algebraic Division**	By the end of this topic, students should be able to… • Use proof by contradiction to prove true statements. • Multiply and divide two or more algebraic fractions. • Add or subtract two or more algebraic fractions. • Convert and 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.	○ **Contradiction** ○ **Assumption** ○ **Rational** ○ **Irrational** ○ **Numerator** ○ **Denominator** ○ **Partial Fraction** ○ **Linear** ○ **Factor** ○ **Multiple**	**Unit 1** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	The course content encourages students to apply logic, reason, construct arguments, critically analyse and communicate effectively. These skills are applied to both number based practice and to wider areas of mathematical application in context as students consider where these ideas could be used in the wider world.
Functions and Graphs – Week 3-4							
	How do we apply transformations to the modulus function?	**2.1 The modulus function** **2.2 Functions and mappings** **2.3 Composite functions** **2.4 Inverse functions** **2.5 $y = \|f(x)\|$ and $y = f(\|x\|)$** **2.6 Combining transformations** **2.7 Solving modulus problems**	By the end of this topic, students should be able to… • Understand and use the modulus function. • Understand mappings and functions and use domain and range.	○ **Modulus** ○ **Function** ○ **Domain** ○ **Range** ○ **Composite** ○ **Inverse**	**Unit 2** - Exercises from the Year 2 Pure Mathematics Textbook and Practice	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Mathematical reasoning. Construction of arguments.

			• 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 functions y=|f(x)| and y=f(|x|). • Apply a combination of two (or more) transformations to the same curve. • Transform the modulus function.		Book by Pearson		
Sequences and Series – Week 5-6							
	What is a series and how do they model real life?	**3.1 Arithmetic sequences** **3.2 Arithmetic series** **3.3 Geometric sequences** **3.4 Geometric series** **3.5 Sum to infinity** **3.6 Sigma notation** **3.7 Recurrence relations** **3.8 Modelling with series**	By the end of this topic, students should be able to… • Find the nth term of an arithmetic sequence. • Prove and use the formula for the sum of the first n terms of an arithmetic sequence. • 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 a 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.	○ **Sequence** ○ **Series** ○ **Arithmetic** ○ **Geometric** ○ **Recurrence relation** ○ **Convergent** ○ **Divergent**	**Unit 3** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Binomial Expansion – Week 6-7							
		4.1 Expanding $(1+x)^n$		○ **Binomial**			

	How do we expand binomials involving fractions?	**4.2 Expanding $(a + bx)^n$** **4.3 Using partial fractions**	By the end of this topic, students should be able to… • Expand $(1 + x)^n$ for any rational constant n and determine the range of values of x for which the expansion is valid. • Expand $(a + bx)^n$ for any rational constant n and determine the range of values of x for which the expansion is valid. • Use partial fractions to expand fractional expressions.	○ **Ascending** ○ **Rational** ○ **Approximation**	**Unit 4** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Mathematical reasoning. Construction of arguments.
Term 2							
Radians – Week 1-2 (8-9)							
	What are the benefits to using an alternative scale for measuring angles?	**5.1 Radian measure** **5.2 Arc length** **5.3 Areas of sectors and segments** **5.4 Solving trigonometric equations** **5.5 Small angle approximations**	By the end of this topic, students should be able to… • 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.	○ **Radians** ○ **Degrees** ○ **Angles** ○ **Arc** ○ **Sector** ○ **Segment**	**Unit 5** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Trigonometric Functions – Week 3-4 (10-11)							

	How do we apply the reciprocal trigonometric functions?	**6.1 Secant, cosecant, and cotangent** **6.2 Graphs of secx, cosecx, and cotx** **6.3 Using secx, cosecx, and cotx** **6.4 Trigonometric identities** **6.5 Inverse trigonometric functions**	By the end of this topic, students should be able to… • Understanding the definitions of secant, cosecant, and cotangent and their relationships 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 $\mathbf{sec^2}\,\boldsymbol{x} \equiv \mathbf{1} + \mathbf{tan}^{\mathbf{2}}\boldsymbol{x}$ and $\mathbf{cosec^2}\,\boldsymbol{x} \equiv \mathbf{1} + \mathbf{cot}^{\mathbf{2}}\boldsymbol{x}$. • Understand and use inverse trigonometric functions and their domains and ranges.	○ **Secant** ○ **Cosecant** ○ **Cotangent** ○ **Identity** ○ **Inverse** ○ **Domain** ○ **Range**	**Unit 6** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Trigonometry and Modelling – Week 5-6 (12-13)							
	How do the trigonometric identities help us to model real life situations?	**7.1 Addition formulae** **7.2 Using the angle addition formulae** **7.3 Double-angle formulae** **7.4 Solving trigonometric equations** **7.5 Simplifying** $a\cos(\theta) \pm b\sin(\theta)$ **7.6 Proving trigonometric identities** **7.7 Modelling with trigonometric functions**	By the end of this topic, students should be able to… • 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 forms $R\cos(\theta \pm \alpha)$ or $R\sin(\theta \pm \alpha)$. • Prove trigonometric identities using a variety of identities.	○ **Prove** ○ **Double-Angle Formulae** ○ **Addition Formula** ○ **Simplify**	**Unit 7** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Mathematical reasoning. Construction of arguments.

			• Use trigonometric functions to model real-life situations.				
Term 3							
Parametric Equations – Week 1-3 (14-15)							
	How do the parametric equations help us to model real life situations?	**8.1 Parametric equations** **8.2 Using trigonometric identities** **8.3 Curve sketching** **8.4 Points of intersection** **8.5 Modelling with parametric equations**	By the end of this topic, students should be able to… • 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** ○ **Cartesian** ○ **Coordinate**	**Unit 8** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Differentiation – Week 3-6 (15-18)							
	How do we apply differentiation to more complex functions and equations?	**9.1 Differentiating sinx and cosx** **9.2 Differentiating exponentials and logarithms.** **9.3 The chain rule** **9.4 The product rule** **9.5 The quotient rule** **9.6 Differentiating trigonometric functions** **9.7 Parametric differentiating** **9.8 Implicit differentiating** **9.9 Using second derivatives** **9.10 Rates of change**	By the end of this topic, students should be able to… • 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.	○ **Derivative** ○ **Differentiate** ○ **Gradient** ○ **Chain Rule** ○ **Product Rule** ○ **Quotient Rule**	**Unit 9** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.

			• Use the second derivate to describe the behaviour of a function. • Solve problems involving connected rates of change and construct simple differential equations.				
Term 4							
Numerical Methods – Week 1-2 (19-20)							
	How can we approximate solutions to equations in context?	**10.1 Locating Roots** **10.2 Iteration** **10.3 The Newton-Raphson Method** **10.4 Applications to modelling**	By the end of this topic, students should be able to… • 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 to the solutions of the equations of the form f(x)=0. • Use numerical methods to solve problems in context.	○ **Roots** ○ **Approximation** ○ **Iteration**	**Unit 10** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Integration – Week 3-5 (20-24)							
	How can we approximate solutions to equations in context?	**11.1 Integrating standard functions** **11.2 Integrating f(ax+b)** **11.3 Using trigonometric identities** **11.4 Reverse chain rule** **11.5 Integration by substitution** **11.6 Integration by parts** **11.7 Partial fractions** **11.8 Finding areas**	By the end of this topic, students should be able to… • Integrate standard mathematical functions including trigonometric and exponential functions and use the reverse of the chain rule to integrate functions of the form f(ax+b).	○ **Integrate** ○ **Chain rule** ○ **Area** ○ **Differential Equations** ○ **Identities**	**Unit 11** - Exercises from the Year 2 Pure Mathematics Textbook and Practice	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.

		11.9 The trapezium rule **11.10 Solving differential equations** **11.11 Modelling with differential equations** **11.12 Integration as the limit of a sum.**	• 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.		Book by Pearson		
Vectors – Week 5-6 (24-25) (May roll over into term 5 if needs be)							
	How do we use vectors to model 3D movement?	**12.1 3D Coordinates** **12.2 Vectors in 3D** **12.3 Solving geometric problems** **12.4 Application to mechanics**	By the end of this topic, students should be able to… • Understand 3D cartesian coordinates. • Use vectors in three dimensions. • Use vectors to solve geometric problems. • Model 3D motion in mechanics with vectors.	○ **Acceleration** ○ **Magnitude** ○ **Direction** ○ **Particle** ○ **Resultant**	**Unit 12** - Exercises from the Year 2 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie**	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Term 5 – Revision in preparation for A-Level Exams.							

	How do we recognise and correct gaps in our understanding?		During this term students will complete personalised revision programs, using a combination of past papers and review exercises to identify areas of weakness, along with practice exercises and workshops to develop those areas.	○ **Resilience** ○ **Accuracy** ○ **Communication** ○ **Persistence** ○ **Drive** ○ **Focus**	**A-Level Maths Exams**	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie, Past Papers.**	