THE ABBEY SCHOOL
A BUSINESS & ENTERPRISE ACADEMY

Mathematics

Year 12
AS Pure mathematics Scheme of Learning

Subject leader: K Ellender

Topics by term	Topic overview for 12 – AS Level maths					
	Term 1	**Term 2**	**Term 3**	**Term 4**	**Term 5**	**Term 6**
	Algebraic Expressions	**Graphs and Transformations**	**Algebraic Methods**	**Trigonometric Ratios**	**Differentiation**	**Integration 2**
	1.1 Index laws	4.1 Cubic graphs	7.1 Algebraic fractions	9.1 The cosine rule	12.1 Gradients of curves	13.5 Areas under curves
	1.2 Expanding brackets	4.2 Quartic graphs	7.2 Dividing polynomials	9.2 The sine rule	12.2 Finding the derivative	13.6 Areas under the x-axis
	1.3 Factorising	4.3 Reciprocal graphs	7.3 The factor theorem	9.3 Areas of triangles	12.3 Differentiating x^n	13.7 Areas between curves and lines
	1.4 Negative and fractional indices	4.4 Points of intersection	7.4 Mathematical proof	9.4 Solving triangle problems	12.4 Differentiating quadratics	
	1.5 Surds	4.5 Translating graphs	7.5 Methods of Proof	9.5 Graphs of sine, cosine and tangent	12.5 Differentiating functions with two or more terms	**Exponentials and Logarithms**
	1.6 Rationalising denominators	4.6 Stretching graphs		9.6 Transforming trigonometric graphs	12.6 Gradients, tangents, and normals	14.1 Exponential functions
		4.7 Transforming functions	**The Binomial Expansion**		12.7 Increasing and decreasing functions	14.2 $y = e^x$
	Quadratics		8.1 Pascal's triangle	**Trigonometric Identities and Equations**	12.8 Second order derivatives	14.3 Exponential modelling
	2.1 Solving equations	**Straight Line Graphs**	8.2 Factorial notation	10.1 Angles in all four quadrants	12.9 Stationary points	14.4 Logarithms
	2.2 Completing the square	5.1 $y = mx + c$	8.3 The binomial expansion	10.2 Exact values of trigonometric ratios	12.10 Sketching gradient functions	14.5 Laws of logarithms
	2.3 Functions	5.2 Equations of straight lines	8.4 Solving binomial problems	10.3 Trigonometric identities	12.11 Modelling with differentiation	14.6 Solving equations using logarithms
	2.4 Quadratic graphs	5.3 Parallel and perpendicular lines	8.5 Binomial estimation	10.4 Simple trigonometric equations		14.7 Working with natural logarithms
	2.5 The discriminant	5.4 Length and area		10.5 Harder trigonometric equations	**Integration 1**	14.8 Logarithms and non-linear data
	2.6 Modelling with quadratics	5.5 Modelling with straight lines		10.6 Equations and identities	13.1 Integrating x^n	
					13.2 Indefinite integrals	
	Equations and inequalities	**Circles**		**Vectors**	13.3 Finding functions	
	3.1 Linear simultaneous equations	6.1 Midpoints and perpendicular bisectors		11.1 Introducing vectors		
	3.2 Quadratic simultaneous equations	6.2 Equation of a circle				
		6.3 Intersection of straight lines and circles				

	3.3 Simultaneous equations on graphs 3.4 Linear Inequalities 3.5 Quadratic Inequalities 3.6 Inequalities on graphs 3.7 Regions	6.4 Use tangent and chord properties 6.5 Circles and triangles		11.2 Representing vectors 11.3 Magnitude and direction 11.4 Position vectors 11.5 Solving geometric problems 11.6 Modelling with vectors	13.4 Definite integrals	

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)
Summer holidays: <mark>**Students will be given a transition booklet that covers the basics. This will recap most of chapter 1. When students return, they will sit an assessment on chapter 1. This unit is an extension on GCSE and should not need covering in full in Year 12. The first week of term 1 will be spent reviewing chapter 1. We will then begin chapter 2.**</mark>
Term 1
Algebraic Expressions – Week 1
2.1 **2.2**	What is meant by the phrase 'algebraic manipulation'?	**1.1 Index Laws** **1.2 Expanding Brackets** **1.3 Factorising** **1.4 Negative and Fractional Indices** **1.5 Surds** **1.6 Rationalising denominators**	By the end of this topic, students should be able to… • understand and use the laws of indices for all rational exponents. • confidently manipulate expressions involving different numbers of brackets. • use and manipulation expressions involving surd notation.	○ **Indices** ○ **Power** ○ **Surd** ○ **Root** ○ **Rational**	**Unit 1** - Exercises from the Year 1 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.
Quadratics – Week 2-3
2.3	How can quadratic equations be used to interpret real world problems?	**2.1 Solving Equations** **2.2 Completing the Square** **2.3 Functions** **2.4 Quadratic Graphs** **2.5 The Discriminant** **2.6 Modelling with Quadratics**	By the end of this topic, students should be able to… • solve quadratic equations through a mixture of factorisation, completing the square, and the quadratic formulae.	○ **Quadratic** ○ **Root** ○ **Discriminant** ○ **Function** ○ **Domain** ○ **Range**	**Unit 2** - Exercises from the Year 1 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.

			• understand and use function notation and the associated terminology. • plot and interpret quadratic graphs. • apply and understand the discriminant. • apply all understanding of quadratic equations to the modelling of real-life situations.			

Equations and Inequalities – Week 4-7 (Room to roll 3.6-3.7 into week 1 of term 3)

						Mathematical reasoning. Construction of arguments.
2.4 **2.5**	How can we represent a solution graphically when the solution is a range of values?	**3.1 Linear Simultaneous Equations** **3.2 Quadratic Simultaneous Equations** **3.3 Simultaneous Equations on Graphs** **3.4 Linear Inequalities** **3.5 Quadratic Inequalities** **3.6 Inequalities on Graphs** **3.7 Regions**	By the end of this topic, students should be able to… • solve simultaneous equations involving two linear equations, or one linear and one quadratic equation. • interpret algebraic solutions of equations graphically. • solve linear and quadratic inequalities. • represent both linear and quadratic inequalities graphically.	○ **Intersection** ○ **Equation** ○ **Inequality** ○ **Solution** ○ **Region**	**Unit 3** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**

Term 2							
Graphs and Transformations – Week 1-3 (8-10)							
2.7 **2.8** **2.9**	How do we sketch and transform graphs of equations?	**4.1 Cubic Graphs** **4.2 Quartic Graphs** **4.3 Reciprocal Graphs** **4.4 Points of Intersection** **4.5 Translating Graphs** **4.6 Stretching Graphs** **4.7 Transforming Functions**	By the end of this topic, students should be able to… • sketch cubic and quartic graphs. • sketch reciprocal graphs in the form $y = \frac{a}{x}$ and $y = \frac{a}{x^2}$. • use intersections to solve equations. • transform graphs by stretching or translating. • transform graphs of unfamiliar functions.	○ **Cubic** ○ **Quartic** ○ **Reciprocal** ○ **Translation** ○ **Transformation** ○ **Function**	**Unit 4** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Mathematical reasoning. Construction of arguments
Straight Line Graphs – Week 4-5 (11-12)							
2.11 **3.1**	How can straight lines equations be used to interpret real world problems?	**5.1** $y = mx + c$ **5.2 Equations of Straight Lines** **5.3 Parallel and Perpendicular Lines** **5.4 Length and Area** **5.5 Modelling with Straight Lines**	By the end of this topic, students should be able to… • understand and apply the link between the equation of a line and its gradient and intercepts. • know and use the gradient rules for parallel and perpendicular lines. • solve area and length problems on a coordinate grid. • use and apply all knowledge of straight lines in a real-world context.	○ **Gradient** ○ **Line Equation** ○ **Intercept** ○ **Parallel** ○ **Perpendicular** ○ **Reciprocal**	**Unit 5** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments
Circles – Week 6-7 (13-14) (Room to roll 6.5 into week 1 of term 3)							

3.2	How do we solve problems involving circles and triangles on a coordinate grid?	**6.1 Midpoints and Perpendicular Bisectors**	By the end of this topic, students should be able to…	o **Bisector**	Unit 6 - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments
		6.2 Equation of a Circle		o **Circle Equation**			
		6.3 Intersection of Straight Lines and Circles	• find the equation of a circle and relevant straight lines.	o **Chord**			
		6.4 Use Tangent and Chord Properties	• use circle properties to solve problems on a coordinate grid.	o **Tangent**			
		6.5 Circles and Triangles	• apply circle theorems to solve problems involving triangles.	o **Subtend**			
				o **Radius**			
				o **Diameter**			
				o **Circumference**			
				o **Arc**			
Term 3							
Algebraic Methods – Week 1-3 (15-17)							
1.1 2.6 2.10	How can our knowledge of algebraic manipulation help use to prove or disprove a mathematical statement?	**7.1 Algebraic Fractions**	By the end of this topic, students should be able to…	o **Numerator**	Unit 7 - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of argument.s
		7.2 Dividing Polynomials		o **Denominator**			
		7.3 The Factor Theorem	• cancel factors in algebraic fractions.	o **Polynomial**			
		7.4 Mathematical Proof	• divide a polynomial by a linear expression.	o **Factorisation**			
		7.5 Methods of Proof	• use the factor theorem to factorise a cubic expression.	o **Direct Proof**			
			• construct mathematical proofs using algebra.	o **Counter Example**			
			• use proof by exhaustion and disproof by counterexample.	o **Exhaustion Proof**			
				o **Cubic**			
				o **Quadratic**			
Binomial Expansion – Week 4-5 (18-19)							
4.1	What is binomial expansion and how is it useful?	**8.1 Pascal's Triangle**	By the end of this topic, students should be able to…	o **Factorial**	Unit 8 - Exercises from the Year 1 Pure Mathematics Textbook and	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Cultural references to Mathematical discoveries. Critical thinking in contextual problems. Mathematical reasoning.
		8.2 Factorial Notation		o **Binomial**			
		8.3 The Binomial Expansion	• use Pascal's triangle to identify binomial coefficients and use them to expand	o **Expand**			
		8.4 Solving Binomial Problems		o **Coefficient**			
		8.5 Binomial Estimation					

			simple binomial expressions.	o **Estimation**	Practice Book by Pearson		Construction of arguments.
			• use combinations and factorial notation.	o **Approximation**			
			• use the binomial expansion to expand brackets.				
			• find individual coefficients in a binomial expansion.				
			• make approximations using the binomial expansion.				
MOCK EXAMS in this term, Week 6 left to allow for adjustment.							
Term 4							
Trigonometric Ratios – Week 1-2 (21-22)							
5.1 **5.5**	How can we further develop our knowledge of trigonometry from GCSE?	**9.1 The Sine Rule** **9.2 The Cosine Rule** **9.3 Areas of Triangles** **9.4 Solving Triangle Problems**	By the end of this topic, students should be able to… • use the cosine rule to find a missing side or angle. • use the sine rule to find a missing side or angle. • find the area of a triangle using an appropriate formula. • solve problems involving triangles.	o **Sine** o **Cosine** o **Tangent** o **Adjacent** o **Opposite** o **Hypotenuse**	**Unit 9** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
5.3		**9.5 Graphs of Sine, Cosine, and Tangent** **9.6 Transforming Trigonometric Graphs.**	• sketch the graphs of the sine, cosine, and tangent functions. • sketch simple transformations of these graphs.	o **Transformation**			
Trigonometric Identities and Equations – Week 3-4 (23-24)							
2.11 **5.2**	What forms can	**10.1 Angles in All Four Quadrants**	By the end of this topic, students should be able to…	o **Identity** o **Equation**	**Unit 10** - Exercises from	**Mathsbox,**	Critical thinking in contextual

5.6 5.7 5.8 5.9	trigonometric equations take, and how should we approach them?	**10.2 Exact Values of Trigonometric Ratios** **10.3 Trigonometric Identities** **10.4 Simple Trigonometric Equations** **10.5 Harder Trigonometric Equations** **10.6 Equations and Identities**	• calculate the sine, cosine, and tangent of any angle. • know the exact trigonometric ratios for 30°, 45° and 60°. • know and use the relationships $tan\,\theta = \frac{sin\theta}{cos\theta}$, and $\sin^2\theta + \cos^2\theta = 1$. • solve simple trigonometric equations of the forms $sin\,\theta = k, cos\,\theta = k$ and $tan\,\theta = k$. • solve more complicated trigonometric equations of the forms $sin\,n\theta = k$ and $sin\,(\theta \pm \alpha) = k$ and equivalent equations involving cos and tan. • solve trigonometric equations that produce quadratics.	o **Double Angle**	the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Pearson Textbook and Practice Book, Mathsgenie.**	problems. Mathematical reasoning. Construction of arguments.
Vectors – Week 5-6 (25-26)							
10.1 10.2 10.3 10.4 10.5	What kind of real-world problems can vectors help us solve?	**11.1 Introducing Vectors** **11.2 Representing Vectors** **11.3 Magnitude and Direction** **11.4 Position Vectors** **11.5 Solving Geometric Problems** **11.6 Modelling with Vectors**	By the end of this topic, students should be able to… • use vectors in two dimensions. • use column vectors and carry out arithmetic operations on vectors.	o **Scalar** o **Column Vector** o **Resultant** o **Magnitude** o **Direction** o **Velocity**	**Unit 11** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.

			• calculate the magnitude and direction of a vector. • understand and use position vectors. • use vectors to solve geometric problems understand vector magnitude and use vectors in speed and distance calculations. • use vectors to solve problems in context.				
Term 5							
Differentiation – Week 1-4 (27-30)							
7.1 **7.2** **7.3** **7.4** **7.6**	How can we formalise the notion of 'rate of change'?	**12.1 Gradients of Curves** **12.2 Finding the Derivative** **12.3 Differentiating x^n** **12.4 Differentiating Quadratics** **12.5 Differentiating Functions with Two or more Terms** **12.6 Gradients, Tangents, and Normals** **12.7 Increasing and Decreasing Functions** **12.8 Second Order Derivatives** **12.9 Stationary Points** **12.10 Sketching Gradient Functions** **12.11 Modelling with Differentiation**	By the end of this topic, students should be able to… • find the derivative, $f'(x)$ or $\frac{dy}{dx}$, of a simple function. • solve problems involving gradients, tangents, and normal. • identify increasing and decreasing functions. • find the second order derivative, $f''(x)$ or $\frac{d^2y}{dx^2}$, of a simple function. • identify stationary points and determine their nature. • sketch the gradient function of a given function.	o **Different iate** o **Derive** o **Gradient** o **Maximu m** o **Minimu m** o **Stationa ry**	**Unit 12** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.

			• model real-life situations with differentiation.				
Integration 1 – Week 5-6 (31-32)							
8.1 8.2 8.3 8.5	What are the practical differences between definite and indefinite integration?	**13.1 Integrating xⁿ** **13.2 Indefinite Integrals** **13.3 Finding Functions** **13.4 Definite Integrals**	By the end of this topic, students should be able to… • find y given $\frac{dy}{dx}$ for x^n. • integrate polynomials. • find $f(x)$, given $f'(x)$ and a point on a curve. • evaluate a definite integral.	○ **Integrate** ○ **Integrand** ○ **Definite** ○ **Indefinite**	**Unit 13** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
Term 6							
Integration 2 – Week 1-2 (33-34)							
	How can we apply integration to properties of graphs?	**13.5 Areas Under Curves** **13.6 Areas Under the x-axis** **13.7 Areas between Curves and Lines**	• find the area bounded by a curve and the x-axis. • find areas bounded by curves and straight lines.				
Exponentials and Logarithms – Week 3-5 (35-37)							
6.1 6.2 6.3 6.4 6.5 6.6 6.7	How can we apply our knowledge of index laws to logarithms? What contexts lend themselves to the application of logarithms?	**14.1 Exponential Functions** **14.2 y = eˣ** **14.3 Exponential Modelling** **14.4 Logarithms** **14.5 Laws of Logarithms** **14.6 Solving Equations Using Logarithms** **14.7 Working with Natural Logarithms** **14.8 Logarithms and Non-Linear Data**	By the end of this topic, students should be able to… • sketch graphs of the form $y = a^x$, $y = e^x$, and transformations of these graphs. • differentiate e^{kx} and understand why this result is important. • use and interpret models that use exponential functions. • recognise the relationship between	○ **Exponent** ○ **Logarithm** ○ **Base** ○ **Index** ○ **Natural Log** ○ **Non-Linear**	**Unit 14** - Exercises from the Year 1 Pure Mathematics Textbook and Practice Book by Pearson	**Mathsbox, Pearson Textbook and Practice Book, Mathsgenie.**	Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.

			exponents and logarithms. • recall and apply the laws of logarithms. • solve equations of the form $a^x = b$. • describe and use the natural logarithm function. • use logarithms to estimate the values of constants in non-linear models.				
END OF YEAR EXAMS, Week 6 left to allow for adjustment.							