

Beths Grammar School KS5 Mathematics Curriculum Map – Year 12

Term	INTENT	IMPLEMENTATION	IMPACT
	Substantive Knowledge This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.	Disciplinary Knowledge (Skills) This is the action taken within a particular topic in order to gain substantive knowledge.	Assessment opportunities What assessments will be used to measure student progress? Evidence of how well students have learned the intended content.
Autumn Term 1A Year 12	<u>PURE – Year 1</u> <u>Chapter 1: Algebraic Expressions</u> 1.1 Index Laws 1.2 Expanding Brackets 1.3 Factorising 1.4 Negative and Fractional Indices 1.5 Surds 1.6 Rationalising Denominators <u>Chapter 2: Quadratics</u> 2.1 Solving Quadratic Equations 2.2 Completing the Square 2.3 Functions 2.4 Quadratic Graphs 2.5 The Discriminant 2.6 Modelling with Quadratics <u>Chapter 3: Equations and Inequalities</u> 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	<u>PURE – Year 1</u> <u>Chapter 1: Algebraic Expressions</u> - Apply the laws of indices - Expand brackets of a single term and two or three expressions - Factorise linear, quadratic and simple cubic expressions - Simplify surds and use the rules of surds - Multiply brackets using surds - Rationalise denominators with surds <u>Chapter 2: Quadratics</u> - Solving quadratic equations by factorising, quadratic formula and completing the square - Sketching quadratic functions as graphs and find the turning points - Find and interpret the discriminant - Modelling with quadratics <u>Chapter 3: Equations and Inequalities</u> - Solve linear simultaneous equations using elimination or substitution - Solve simultaneous linear and quadratic equations algebraically - Solve simultaneous linear and quadratic equations graphically - Solution of linear and quadratic inequalities in one variable - Represent and interpret inequalities graphically <u>Chapter 4: Graphs and Transformations</u>	- In class teacher assessment through Q&A - End of chapter mini test (with peer marking) - Chapter revision exercise via textbook - End of term review exercises via textbook - End of term formal mixed chapter assessment - Mymaths topic codes: <u>PURE – Year 1</u> 1.1: 2033 1.2: 1.3: 2006, 2014 1.4: 2034, 2035 1.5: 2036 1.6: 2037, 2255 Recap chp 1: 3006 2.1: 2015, 2016 2.2: 2017 2.3: 2257(Q1) 2.4: 2025 2.5: 2026, 3004

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	<u>Chapter 4: Graphs and Transformations</u> • 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 <u>Chapter 5: Straight Line Graphs</u> • 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 <u>Chapter 7: Algebraic Methods</u> • 7.1 Algebraic Fractions • 7.2 Dividing Polynomials • 7.3 The Factor Theorem • 7.4 Mathematical Proof • 7.5 Methods of Proof	• Sketching graphs of cubic, quartic and reciprocal functions • Solving equations using intersections of graphs • Transformation of graphs $af(x)$, $f(x) + a$, $f(x + a)$, $f(ax)$ Transform graphs of unfamiliar functions <u>Chapter 5: Straight Line Graphs</u> • Calculate the gradient of a line joining a pair of points • Find the equation of a line through two points expressing it in the form $y = mx + c$ or $ax + by + c = 0$ • Find the point of intersection for a pair of straight lines • Know and use the rules for parallel and perpendicular gradients • Solve length and area problems on coordinate grids • Use straight lines to construct mathematical models <u>Chapter 7: Algebraic Methods</u> • Simplify rational algebraic expressions • Algebraic Division by a linear expression • Use the Factor Theorem to factorise a cubic expression • Construct mathematical proof using algebra • Use proof by exhaustion and counter- example	2.6: 3.1: 3.2: 2018 3.3: 3.4: 2008 3.5: 2009, 2256 3.6: 3.7: 4.1: 4.2: 2027 4.3: 4.4: 4.5: 4.6: 4.7: 2022, 2023, 2024 5.1: 2002, 2003 5.2: 2004, 2005 5.3: 2252(Q1), 3042 5.4: 5.5: 7.1: 7.2: 2043 7.3: 2042, 2259 7.4: 7.5: 2252, 2253
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Autumn Term 1B Year 12	<u>Chapter 6: Circles</u> 6.1 Midpoints and Perpendicular Bisectors 6.2 Equation of a Circle 6.3 Intersections of Straight Lines and Circles 6.4 Use Tangent and Chord Properties 6.5 Circles and Triangles <u>Chapter 8: The Binomial Expansion</u> 8.1 Pascals Triangle 8.2 Factorial Notation 8.3 The Binomial Expansion 8.4 Solving Binomial Problems 8.5 Binomial Estimation <u>Chapter 9: Trigonometry</u> 9.1 The Cosine Rule 9.2 The Sine Rule 9.3 Areas of Triangles 9.4 Solving Triangle Problems 9.5 Graphs of sine, cosine and tangent 9.6 Transforming Trigonometric Graphs <u>Chapter 12: Differentiation</u> 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 normal 12.7 Increasing and decreasing Functions	<u>Chapter 6: Circles</u> - Find the midpoint of a line segment - Find the equation of the perpendicular bisector to a line segment - Know how to find the equation of a circle - Solve geometric problems involving straight lines and circles - Use circle properties to solve problems on coordinate grids - Find the angle in a semicircle and solve other problems involving circles and triangles <u>Chapter 8: The Binomial Expansion</u> - Use Pascals triangle to identify coefficients and use them to expand simple binomial expressions - Use combination and factorial notation - Use the binomial expansion to expand brackets - Find individual coefficients in a binomial expansion - Make approximations using the binomial expansion <u>Chapter 9: Trigonometry</u> - 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 the appropriate formula - Solve problems involving triangles - Sketch the graphs of the sine, cosine and tangent functions - Sketch simple transformations of trigonometric graphs <u>Chapter 12: Differentiation</u> - Find the derivative, $f'(x)$ or $\frac{dy}{dx}$ of a simple function - Use the derivative to 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	- In class teacher assessment through Q&A - End of chapter mini test (with peer marking) - Chapter revision exercise via textbook - End of term review exercises via textbook - End of term formal assessments - Mastery homework with use of mymaths.co.uk - Mymaths topic codes: <u>PURE – Year 1</u> 6.1: 2001 6.2: 2020 6.3: 6.4: 2021 6.5: 8.1: 8.2: 8.3: 8.4: 8.5: 2041 9.1: 2046 9.2: 2045 9.3: 9.4: 9.5: 9.6: 2049
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	12.8 Second Order Derivatives 12.9 Stationary Points 12.10 Sketching Gradient Functions 12.11 Modelling with Differentiation <u>Chapter 10: Trigonometric Identities and Equations</u> 10.1 Angles in all four quadrants 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	- Find the stationary points of functions and determine their nature - Sketch the gradient function of a given function - Model real-life situations with differentiation <u>Chapter 10: Trigonometric Identities and Equations</u> - Calculate the sine, cosine and tangent of any angle - Know the exact trigonometric ratios for 30°, 45° and 60° - Know and use $\tan \theta = \frac{\sin \theta}{\cos \theta}$ and $\sin^2 \theta + \cos^2 \theta = 1$ - Solve simple trigonometric equations of the form $\sin \theta = k$, $\cos \theta = k$ and $\tan \theta = k$ - Solve more complicated trigonometric equations of the form $\sin n\theta = k$ and $\sin(\theta \pm \alpha) = k$ and equivalent equations involving $\cos$ and $\tan$ - Solve trigonometric equations that produce quadratics	12.1: 12.2: 12.3: 12.4: 12.5: 12.6: 2028, 2029, 2030 12.7: 12.8: 12.9: 2270 12.10: 2269 12.11: Chapter 12 revision: 3005 10.1: 10.2: 2284 10.3: 10.4: 2047, 2048 10.5: 2257(Q2), 2285 10.6: 2053 Chapter 10 revision: 3010, 3043
Spring Term 2A Year 12	<u>Chapter 13: Integration</u> 13.1 Integrating x^n 13.2 Indefinite Integrals 13.3 Finding Functions 13.4 Definite Integrals 13.5 Areas Under Curves 13.6 Areas Under the x-axis 13.7 Areas Between Curves and Lines <u>Chapter 11: Vectors</u> 11.1 Vectors 11.2 Representing Vectors 11.3 Magnitude and Direction	<u>Chapter 13: Integration</u> - Find y given $\frac{dy}{dx}$ for x^n - Integrate polynomials - Find $f(x)$, given $f'(x)$ and a point on the curve - Evaluate a definite integral - Find the area bounded by a curve and the x-axis - Find areas bounded by curves and straight lines <u>Chapter 11: Vectors</u> - Use vectors in two dimensions - Use column vectors and carry out arithmetic operations on vectors - Calculate the magnitude and directions of a vectors	- In class teacher assessment through Q&A - End of chapter mini test (with peer marking) - Chapter revision exercise via textbook - End of term review exercises via textbook - End of term formal assessments - Mastery homework with use of mymaths.co.uk - Mymaths topic codes:

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	• 11.4 Position Vectors • 11.5 Solving Geometric Problems • 11.6 Modelling with Vectors <u>Chapter 14: Exponentials and Logarithms</u> • 14.1 Exponential Functions • 14.2 $y = e^x$ • 14.3 Exponentials 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 <u>STATISTICS – Year 1</u> <u>Chapter 1: Data Collection</u> • 1.1 Populations and Samples • 1.2 Sampling • 1.3 Non-Random Sampling • 1.4 Types of Data • 1.5 The Large Data Set <u>Chapter 2: Measures of Location and Spread</u> • 2.1 Measures of Central Tendency • 2.2 Other Measures of Location • 2.3 Measures of Spread • 2.4 Variance and Standard Deviation • 2.5 Coding	• 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 <u>Chapter 14: Exponentials and Logarithms</u> • Sketch graphs of the form $y = a^x$, $y = e^x$ and transformations of these graphs • Differentiate e^{kx} and understand why the result is important • Use and interpret models that use exponential functions • Recognise the relationship between 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 <u>STATISTICS – Year 1</u> <u>Chapter 1: Data Collection</u> • Understand ‘population’, ‘sample’ and ‘census’ and comment on the advantages and disadvantages of each • Understand the advantages and disadvantages of simple random sampling, systematic sampling, stratified sampling, quota sampling and opportunity sampling <u>Chapter 2: Measures of Location and Spread</u> • Calculate measures of central tendency such as mean, median and mode • Calculate measure of location such as percentiles and deciles • Calculate measures of spread such as range, interquartile range and interpercentile range • Calculate variance and standard deviation • Understand and use coding	<u>Pure – Year 1</u> 13.1: 13.2: 2054 13.3: 2055 13.4: 13.5: 2056 13.6: 2057 13.7: 2059, 2273, 2274 Chapter 13 revision: 3045 11.1: 11.2: 11.3: 2206 11.4: 2207 11.5: 11.6: 3048 14.1: 2061 14.2: 2133 14.3: 2136 14.4: 2142 14.5: 2062 14.6: 2257(Q1), 2063 14.7: 2134, 2135 14.8: 2268 Chapter 14 revision: 3012, 3022 Year 1 revision: 3002, 3003 <u>STATISTICS – Year 1</u> 1.3: 2275 2.1: 2279 2.2: 2282 2.3: 2280 2.4: 2281
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	<u>Chapter 3: Representations of Data</u> 3.1 Outliers 3.2 Box Plots 3.3 Cumulative Frequency 3.4 Histograms 3.5 Comparing Data	<u>Chapter 3: Representations of Data</u> - Identify outliers in data sets - Draw and interpret box plots - Draw and interpret cumulative frequency diagrams - Draw and interpret histograms - Compare two data sets	Chapter 2 review: 3251, 3015 3.2: 2276 3.3: 2277 3.4: 2278 Chapter 3 review: 3253
Spring Term 2B Year 12	<u>STATISTICS – Year 1</u> <u>Chapter 4: Correlation</u> 4.1 Correlation 4.2 Linear Regression <u>Chapter 5: Probability</u> 5.1 Calculating with Probabilities 5.2 Venn Diagrams 5.3 Mutually Exclusive and Independent Events 5.4 Tree Diagrams <u>Chapter 6: Statistical Distributions</u> 6.1 Probability Distributions 6.2 The Binomial Distribution 6.3 Cumulative Probabilities	<u>STATISTICS – Year 1</u> <u>Chapter 4: Correlation</u> - Draw and interpret scatter diagrams for bivariate data - Interpret correlation and understand that it does not cause imply causation - Interpret the coefficients of a regression line equation for bivariate data - Understand when to use a regression line to make predictions <u>Chapter 5: Probability</u> - Calculate probabilities for single events - Draw and interpret Venn diagrams - Understand mutually exclusive and independent events, and determine whether two events are independent - Use and understand tree diagrams <u>Chapter 6: Statistical Distributions</u> - Understand and use simple discrete probability distributions including the discrete uniform distribution - Understand the binomial distribution as a model and comment on appropriateness - Calculate individual probabilities for the binomial distribution - Calculate cumulative probabilities for the binomial distribution	- In class teacher assessment through Q&A - End of chapter mini test (with peer marking) - Chapter revision exercise via textbook - End of term review exercises via textbook - End of term formal assessments - Mastery homework with use of mymaths.co.uk - Mymaths topic codes: <u>STATISTICS – Year 1</u> 4.1: 2283 Chapter 3 and 4 review: 3252 5.1: 2091 5.2: 2092, 2095 5.3: 2093 5.4: 2094 Chapter 5 review: 3250 6.1: 2114 6.2: 2110, 2111 6.3: 2112

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	<u>MECHANICS – Year 1</u> <u>Chapter 8: Modelling in Mechanics</u> • 8.1 Constructing a Model • 8.2 Modelling Assumptions • 8.3 Quantities and Units • 8.4 Working with Vectors <u>Chapter 9: Constant Acceleration</u> • 9.1 Displacement-Time Graphs • 9.2 Velocity-Time Graphs • 9.3 Constant Acceleration Formulae 1 • 9.4 Constant Acceleration Formulae 2 • 9.5 Vertical Motion Under Gravity <u>Chapter 11: Variable Acceleration</u> • 11.1 Functions of Time • 11.2 Using Differentiation • 11.3 Maxima and Minima Problems • 11.4 Using Integration • 11.5 Constant Acceleration Formulae	<u>MECHANICS – Year 1</u> <u>Chapter 8: Modelling in Mechanics</u> • Understand how the concept of a mathematical model applies to mechanics • Understand and be able to apply some of the common assumptions used in mechanical models • Know SI units for quantities and derived quantities used in mechanics • Know the difference between scalar and vector quantities <u>Chapter 9: Constant Acceleration</u> • Understand and interpret displacement-time graphs • Understand and interpret velocity-time graphs • Derive the constant acceleration formulae and use them to solve problems • Use the constant acceleration formulae to solve problems involving vertical motion under gravity <u>Chapter 11: Variable Acceleration</u> • Understand that displacement, velocity and acceleration may be given as functions of time • Use differentiation to solve kinematic problems • Use calculus to solve problems involving maxima and minima • Use integration to solve kinematic problems Use calculus to derive constant acceleration formulae	Chapter 6 review: 3018, 3019 <u>MECHANICS – Year 1</u> 9.2: 2183 9.4: 2184 9.5: 2185 11.2: 2289, 3027 11.3: 2180 11.4: 2181
Summer Term 3A Year 12	<u>STATISTICS – Year 1</u> <u>Chapter 7: Hypothesis Testing</u> • 7.1 Hypothesis Testing • 7.2 Finding Critical Values • 7.3 One-tailed Tests • 7.4 Two Tailed Tests	<u>STATISTICS – Year 1</u> <u>Chapter 7: Hypothesis Testing</u> • Understand the language and concept of hypothesis testing • Understand that a sample is used to make an inference about a population • Find the critical values of a binomial distribution using tables • Carry out a one-tailed test for the proportion of the binomial distribution and interpret the results	• In class teacher assessment through Q&A • End of chapter mini test (with peer marking) • Chapter revision exercise via textbook • End of term review exercises via textbook

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	<u>MECHANICS – Year 1</u> <u>Chapter 10: Forces and Motion</u> 10.1 Force Diagrams 10.2 Forces as Vectors 10.3 Forces and Acceleration 10.4 Motion in 2 Dimensions 10.5 Connected Particles 10.6 Pulleys <u>PURE – Year 2</u> <u>Chapter 5: Radians</u> 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	- Carry out a two-tailed test for the proportion of the binomial distribution and interpret the results <u>MECHANICS – Year 1</u> <u>Chapter 10: Forces and Motion</u> - Draw force diagrams and calculate resultant forces - Understand and use Newton's first law - Calculate resultant forces by adding vectors - Understand and use Newton's second law, $F = ma$ - Apply Newton's second law to vector forces and acceleration - Understand and use Newton's third law - Solve problems involving connected particles <u>PURE – Year 2</u> <u>Chapter 5: Radians</u> - 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	- End of term formal assessments - Mastery homework with use of mymaths.co.uk - Mymaths topic codes: <u>STATISTICS – Year 1</u> 7.3: 2115 <u>MECHANICS – Year 1</u> 10.1: 2186 10.3: 2187 10.4: 2293 10.5: 2188 Chapter 10 review: 3030 <u>PURE – Year 2</u> 5.3: 2050 5.4: 2155 5.5: 2266
Summer Term 3B Year 12	<u>PURE – Year 2</u> <u>Chapter 1: Algebraic Methods</u> 1.1 Proof by Contradiction 1.2 Algebraic Fractions 1.3 Partial Fractions 1.4 Repeated Factors 1.5 Algebraic Division	<u>PURE – Year 2</u> <u>Chapter 1: Algebraic Methods</u> - 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 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	- In class teacher assessment through Q&A - End of chapter mini test (with peer marking) - Chapter revision exercise via textbook - End of term review exercises via textbook - End of term formal mixed chapter assessment - Mymaths topic codes:

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	<u>Chapter 2: Functions and Graphs</u> • 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 <u>Chapter 6: Trigonometric Functions</u> • 6.1 Secant, Cosecant and Cotangent • 6.2 Graphs of $\sec x$, $\operatorname{cosec} x$ and $\cot x$ • 6.3 Using $\sec x$, $\operatorname{cosec} x$ and $\cot x$ • 6.4 Trigonometric Identities • 6.5 Inverse Trigonometric Functions <u>Chapter 7: Trigonometry and Modelling</u> • 7.1 Addition Formulae • 7.2 Using the Addition Formulae • 7.3 Double Angle Formulae • 7.4 Solving Trigonometric Equations • 7.5 Simplifying $a \cos x \pm b \sin x$ • 7.6 Proving Trigonometric Identities • 7.7 Modelling with Trigonometric Functions	<u>Chapter 2: Functions and Graphs</u> • 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 functions $y = f(x)$ and $y = f(x)$ • Apply a combination of two (or more) transformations to the same curve • Transform the modulus function <u>Chapter 6: Trigonometric functions</u> • Understand the definitions 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 $\operatorname{cosec}^2 x \equiv 1 + \cot^2 x$ <u>Chapter 7: Trigonometry and Modelling</u> • 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 • Use trigonometric functions to model real-life situations	<u>PURE – Year 2</u> 1.1: 2254 1.2: 2200 1.3: 2260 2.3: 2007, 2139 2.4: 2138, 2040 2.5: 2261 2.7: 3023 6.3: 2019 6.4: 2156 7.2: 2157 7.3: 2158 7.4: 3044 7.5: 2159, 2160, 3025
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