Curriculum Plan - Maths

Year 12

Golden Treads: The overarching themes throughout the course are:			**Enrichment:** KS5 Surgery (Tues/Thurs), UKMT Maths Challenge, support with STEP/MUA test preparation.	**Review and evaluation:** July 2025
- Mathematical augment, language and Proof - Mathematical problem solving - Mathematical Modelling				

	Topics (and chapter numbers)	Assessment	Substantive Knowledge	Misconceptions	Key Vocabulary	Knowledge tracking
Term 1 **Teacher 1**	<u>Pure Year 1</u> 1. Algebraic Expressions 2. Quadratic functions 3. Equations and Inequalities 9. Trig ratios and graphs	**Headstart test – 2nd week of term, testing key GCSE skills** 1 fully marked review sheet	Algebraic expressions – basic algebraic manipulation, indices and surds Quadratic functions – factorising, solving, graphs and the discriminants Equations – quadratic/linear simultaneous Inequalities – linear and quadratic (including graphical solutions) Trigonometric ratios and graphs	• Simplifying expressions with index rules when the bases are different • Forgetting to change the sign when rationalising harder surds • Missing out the two middle terms when expanding a quadratic • Factorising but not solving • Not flipping the inequality sign when multiplying/dividing by a negative • Setting equations equal to each other without rearranging them to make them equal first • Only finding one solution to a trig function • Using the wrong symmetry rules for a trig function (not drawing a graph)	Indices Surds Simplify Factorise Expand Quadratic Linear Expression Equation Inequality Trigonometric Sine Cosine Tangent Solution	**Before:** **Ch1 (from GCSE)** -Collecting like terms -Index laws -Expanding/Factorising -HCF (algebraic) -Simplifying algebraic fractions **Ch2 (from GCSE)** -Solving linear equations -Solving quadratics **Ch3 (from GCSE and Ch2)** - Set notation -Simplifying surds -Simultaneous equations (all methods) -Quadratic graphs **Ch9 (from GCSE and Ch4)** -Trigonometry -Sketching transformations of graphs **After:** **Ch9 (to Ch 10 and Yr2 Ch5)** Ch10 – solving trig equations and proving identities Year 2 Ch5 - Radians
Teacher 2	<u>Pure Year 1</u> 4. Graphs and transformations 5. Straight line graphs 12. Differentiation	1 fully marked review sheet 1 partially marked review sheet	Graphs – cubic, quartic and reciprocal - Using intersection points Transformations – transforming graphs – f(x) notation Straight-line graphs, parallel/perpendicular, length and area problems Differentiation - Definition, differentiating polynomials, second derivatives Gradients, tangents, normals, maxima and minima	• Factorising but not solving and so getting the opposite signs for each root • Setting equations equal to each other without rearranging them to make them equal first • Getting x and y transformations mixed up • Mixing up stretches and shifts • Finding the negative reciprocal for the gradient of a tangent to a curve • Using the gradient of a curve rather than its magnitude for area problems • Mixing up the definitions of maximum and minimum	Cubic Quartic Polynomial Reciprocal Intersection Transformation Translation Stretch Function Parallel Perpendicular Gradient Y-intercept Differentiation Derivative	**Before:** **Ch4 (from GCSE)** -Factorising and sketching quadratics - Table of values to draw graphs -Simultaneous equations **Ch5 (from GCSE and Ch1)** -Simplifying surds -Finding intersections of linear equations -Changing the subject **Ch12 (from GCSE and Ch1,5)** -Finding gradients of linear equations -Index notation -Finding equations of straight lines **After:** **Ch4 (to Ch9 and Y2 Ch2)** - Trig graph transformations

					Tangent Normal Stationary point	- Function notation and modulus functions **Ch5 (to Ch6 and Ch7 and Stats/Mech)** - Tangents and normals to higher polynomials and circles - Regression lines - Displacement-time graphs, velocity time graphs **Ch12 (to Ch13 and Ch14 and Mech, and all Pure Y2)** - Integration as the inverse - Differentiating and integrating exponentials - Variable acceleration problems - Harder integration in Y2
Term 2 Teacher 1	9. Trig ratios and graphs 10. Trig identities and equations 7. Algebraic methods	1 fully marked review sheet 1 partially marked review sheet	Trigonometric ratios and graphs Trigonometric identities and equations Algebraic division, factor theorem and proof	• Only finding one solution to a trig function • Using the wrong symmetry rules for a trig function (not drawing a graph) • Dividing by a trig ratio and not considering the value of the function for a solution • Trying to solve with multiple different trig functions in the equation • Getting the wrong sign for the remainder of algebraic division	Trigonometric Sine Cosine Tangent Solution Acute Obtuse Periodic Identity Polynomial Factor Quotient Divisor Remainder Factor Theorem Deduction Exhaustion Counter-example	**Before:** **Ch9 (from GCSE and Ch4)** -Trigonometry (GCSE) -Sketching transformations of graphs (Ch4) **Ch10 (from Ch9 and Ch2)** -Sketching trig graphs to find multiple solutions (Ch9) -Trigonometry (including solving) (GCSE) -Solving quadratics (Ch2) **Ch7 (from GCSE, Ch1, Ch2, Ch5)** -Simplifying indices (Ch1) -Factorising quadratics (Ch2) -Long division (GCSE) -Finding linear equations from coordinates (Ch5) -Completing the square (Ch2) **After:** **Ch9 and 10 (to most subsequent chapters)** - Using trig with vectors to find angles and distances in pure and mechanics - Introducing radians in Y2 - Differentiating and integrating trig functions **Ch7** - Further proof in Y2 Ch1, proof by contradiction - Combining skills with coordinate geometry and sketching polynomials
Teacher 2	13. Integration 11. Vectors	**Pure Assessment in last week of Nov on Chapters 1-5, 9-13**	Integration Definition as opposite of differentiation, indefinite integrals of xn Definite integrals and areas under curves Vectors	• Forgetting to put the +c! • Giving a negative answer for an area • Not splitting up an integral to account for negative sections of area • Not subtracting the whole value for the lower limit (getting signs mixed up when plugging in limits)	Integration Differentiation Integral Indefinite/definite Limits Constant	**Before:** **Ch13 (from Ch1, 12, 4)** -Simplifying index notation (Ch1) -Differentiation (Ch12) -Sketching graphs (Ch4) **Ch11 (from GCSE and Ch9)**

	6. Circles	1 fully marked review sheet	Definitions, magnitude/direction, addition and scalar multiplication. Position vectors, distance between two points, geometric problems Circles Equation of a circle, geometric problems on a grid	• Mixing up scalars and vectors • Using the wrong directions for vectors • Adding position vectors to find the vector between them, rather than subtracting (AB=OB-OA) • Using the same vector twice for a proof rather than two different routes and setting them equal to each • Forgetting that the radius is squared in the equation for a circle • Having the opposite signs for their centre (factorising but not solving) • Using the same gradient for their radius and their tangent	Vector Scalar Magnitude Direction Radius Diameter Centre Tangent Normal Intersection	-Translations -Ratio problem solving -Sine and cosine rule (Ch9) **Ch6 (from GCSE and Ch5)** -Completing the square -Linear equations from points -Equations of linear graphs (Ch5) **After:** **Ch13 (to Pure Y2 and Mech)** - Leading onto much more integration in Y2! Substitution, by parts, partial fractions, etc. - Variable acceleration problems in Mech **Ch11 (to Mech)** - Expressing motion with vectors **Ch6 (to Pure Y2 Ch8)** - using trig identities in parametric equations to turn into Cartesian equations for circles
Term 3 **Teacher 1**	8. Binomial expansion **Applied Year 1** Statistics 1. Data collection Statistics 2. Measures of location and spread	1 fully marked review sheet 1 partially marked review sheet	The binomial expansion Statistical sampling: Understand and use sampling techniques, including simple random sampling and opportunity sampling. Select or critique sampling techniques in the context of solving a statistical problem, including understanding that different samples can lead to different conclusions about the population. Data Presentation - Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation; Understand and use coding	• Increasing the power of both terms in their expansion, rather than one increasing as the other decreases • Forgetting that the first term on any row of Pascal's Triangle is 1 • Not raising the power of the coefficient of the x term in the bracket • Neglecting their negative signs' powers • Mixing up "ascending" and "descending" • Mixing up sampling methods • Not mentioning a sampling frame • Mixing up vocabulary	Polynomial Binomial Index Sampling Quota Systematic Stratified Sampling frame Average Median Mean Mode Standard deviation Range Interquartile range Coding	**Before:** **Ch8 (from Ch1)** -Expanding polynomials (Ch1) -Simplifying indices (Ch1) **Stats Ch1 (from GCSE)** -Averages -Questionnaires -Frequency tables **Stats Ch2 (from GCSE)** -Types of data -Averages from frequency tables -Drawing charts from tables **After:** **Ch8 (to Pure Y2 Ch4)** - further binomial expansion **Stats Ch1 (to Stats Ch2)** - using the large data set for further statistical calculations **Stats Ch2** - calculating averages from different representations of data

Teacher 2	6. Circles 14. Exponentials and logarithms **Applied Year 1** Mechanics 8. Modelling in mechanics	**Full AS Pure paper at end of term 3** 1 fully marked review sheet	Circles – equation of a circle, geometric problems on a grid Exponentials and logarithms - Exponential functions and natural logarithms Kinematics: Graphical representation of velocity, acceleration and displacement	• Forgetting that the radius is squared in the equation for a circle • Having the opposite signs for their centre (factorising but not solving) • Using the same gradient for their radius and their tangent • Taking logarithms of individual terms rather than the whole side of an equation • Getting the sign the wrong way round when using inequalities and modelling with exponentials • Using the wrong base for a logarithm • Combining exponential terms with different bases • Reducing the exponent when differentiating an exponential term • Mixing up vectors and scalars • Inaccuracy when converting between units of measurement	Radius Diameter Centre Tangent Normal Perpendicular Bisector Chord Intersection Exponential Logarithm Natural logarithm Speed Velocity Distance Displacement Acceleration Lamina Uniform Mass	**Before:** **Ch6 (from Ch2 and Ch5)** -Completing the square -Linear equations from points -Using discriminant (Ch2) -Parallel/perpendicular equations (Ch5) **Ch 14 (from Ch1 and Ch5)** -Evaluating indices -Simplifying indices -Finding gradients and intercepts graphically **Mech Ch8 (from Pure Ch2, Ch9, 10 and GCSE)** -Solving quadratics (Pure Ch2) -Trigonometry (Pure Ch9/10) -Unit conversion (GCSE) -Standard Form (GCSE) **After:** **Ch6 (to Pure Y2 Ch8)** - using trig identities in parametric equations to turn into Cartesian equations for circles **Ch14 (to Pure Y2 Ch9 and 11)** - integrating and differentiating exponentials **Mech Ch8 (to rest of Mech)** - sets up the rest of the module
Term 4 **Teacher 1**	Statistics 3. Representations of data Statistics 4. Correlation Statistics 5. Probability Statistics 6. Statistical distributions	1 fully marked review sheet 1 partially marked review sheet	Data Presentation - Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation; Understand and use coding Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems Probability: Mutually exclusive events; Independent events Statistical distributions Use discrete distributions to model real-world situations; Identify the discrete uniform distribution; Calculate	• Inaccurate lines of best fit (due to misconceptions such as thinking it must go through the origin) • Only comparing location *or* spread when comparing two sets of data, rather than commenting on both • Answering a "describe the relationship" with a type of correlation (and vice versa) • Using a different definition for an outlier if the question specifies which one to use • Mixing up discrete and continuous data definitions • Forgetting the conditions required to use a binomial distribution • Mixing up cumulative probability and specific probability mass functions • Errors in lengthy calculator calculations	Outlier Anomaly Quartile Interquartile range Cumulative frequency Histogram Frequency density Class width Location Spread Correlation Causation Linear regression Independent/dependent Interpolation/Extrapolation Event Outcome Sample space Venn diagram	**Before:** **Stats Ch3 (from GCSE and Stats Ch2)** -Averages -Questionnaires -Frequency tables **Stats Ch4 (from GCSE and Pure Ch5)** -Scatter diagrams (GCSE) -Gradients and y-intercepts (Pure Ch5) **Stats Ch5 (from GCSE)** -Simple probability -Sample Space diagrams -Tree diagrams **Stats Ch6 (from Stats Ch5 and GCSE)** -Combined probability **After:** **All to Year 2 Stats**

			probabilities using the binomial distribution (calculator use expected)		Intersection Union Complement Mutually exclusive Tree diagram Random variable Discrete Probability distribution Binomial distribution Cumulative	– conditional probability, regression, correlation and normal distribution
Teacher 2	Mechanics 9. Constant acceleration Mechanics 10. Forces and motion	AS Applied paper (self-marked) 1 fully marked review sheet	• 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 • 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	• Using the wrong axes for displacement-time graphs and velocity-time graphs • Not being consistent with which direction is positive within a SUVAT question • Always using gravity as acceleration • Using s as distance travelled rather than displacement (or vice versa if the question asks for distance travelled) • Not labelling every force on a force diagram • Only using the positive force when using F=ma, not the resultant force • Neglecting to consider tension in both directions (and forgetting that it's equal in most questions due to modelling assumptions)	Displacement Velocity Constant acceleration Gravity Rate of change Resultant Tension Normal reaction Rough/smooth Inextensible Limitation	**Before:** **Mech Ch9 (from GCSE and Pure Ch2 and Ch3)** -Area under linear graphs (GCSE) -SDT (GCSE) -Simultaneous equations (Pure Ch3) -Solving quadratics (Pure Ch2) **Mech Ch10 (from GCSE, Pure Ch7)** -Vector addition -Trigonometry -SUVAT equations (Ch9) **After:** **Mech Ch9 and 10 (to Ch11 and Mech Y2)** - variable acceleration - projectiles - moments - friction
Term 5 Teacher 1	Statistics 6. Statistical distributions Statistics 7. Hypothesis Testing	<mark>Year 12 internal assessments – full AS pure paper and full AS applied paper</mark>	Language of hypothesis testing; Significance levels Carry out hypothesis tests involving the binomial distribution	• Mixing up the null hypothesis and the alternative hypothesis • Wrong notation • Mixing up one and two tailed tests • Not being specific enough in conclusions/putting it in the context of the question • Reaching the wrong conclusion from the value reached • Forgetting to do 1-p for the upper tail • Not halving the significance level for a two tailed test	Event Outcome Sample space Venn diagram Intersection Union Complement Mutually exclusive Tree diagram Random variable Discrete Probability distribution Binomial distribution	**Before:** **Stats Ch7 (from Stats Ch6)** - Statistical distributions **After:** **To Stats Y2** - normal distributions - normal hypothesis testing

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					Cumulative Test statistic Hypothesis (null/alternative) Significance level Critical value/region One tailed test Two tailed test	
Teacher 2	Mechanics 11. Variable acceleration	1 fully marked review sheet 1 fully marked practice paper	• Understand that displacement, velocity and acceleration may be given as functions of time • Use differentiation to solve kinematics problems • Use calculus to solve problems involving maxima and minima • Use integration to solve kinematics problems • Use calculus to derive constant acceleration formulae	• Trying to use SUVAT on variable acceleration questions • Using differentiation instead of integration and vice versa • Concluding a stationary point is a maximum when it's a minimum and vice versa • Not using boundary conditions to find the value of the +c	Displacement Velocity Acceleration Kinematics Differentiation Integration Calculus	**Before:** **Mech Ch11 (from Mech Ch8 and Pure Ch12 and Ch13)** -Differentiation (Pure Ch12) -Integration (Pure Ch13) **After:** **To Mech Y2** - Using vectors - Projectiles - Inclined planes - Friction - Further kinematics
Term 6 **Teacher 1**	**Pure Year 2** 5. Radians 6. Trig functions	1 fully marked review sheet	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 theta is small Trig functions - Secant, cosecant and cotangent - Graphs of sec, cosec and cot - Using sec, cosec and cot - Trig identities - Inverse Trig identities	• Setting π radians equal to 360 degrees (rather than 2π) • Forgetting the essential formulae • Having the calculator in the wrong setting • Mixing up the definitions of the new trig functions (forgetting the "third letter rule")	Degree Radian Trigonometric function Arc Radius Circumference Sector Segment Approximate Exact value Secant Cosecant Cotangent Identity Inverse function	**Before:** **Pure Year 2 Ch5 (from Pure Y1 Ch9 and 10)** - Basic trigonometry - Solving trig equations **Pure Year 2 Ch6 (from Pure Y1 Ch9 and 10)** - Basic trigonometry - Solving trig equations **After:** **Pure Year 2 Ch5 and 6 (to all subsequent Pure Y2)** - calculus with trig - modelling with trig - trig in parametric equations
Teacher 2	**Pure Year 2** 1. Algebraic methods	1 fully marked review sheet	- Proof by contradiction - Partial fractions - Algebraic division Functions and Graphs	• Not stating an appropriate (and comprehensive) assumption of the negated statement to start a proof • Not giving a suitable conclusion to their proof	Proof Contradiction Algebraic manipulation Modulus Function Mapping	**Before:** **Pure Year 2 Ch1 (from Pure Y1 Ch2 and Ch7)** Factorising polynomials Simplifying algebraic fractions Algebraic proof

| | 2. Functions and graphs | | - Modulus
- Functions and mappings
- Composite and inverse
- Combining transformations
- Solving modulus problems | • Not showing enough steps within their algebraic manipulation in their proof
• Reflecting the whole graph when taking the modulus, rather than just the negative section
• Not considering both sections when finding points of intersection with a modulus graph (both the original graph and the section that's been reflected)
• Mixing up notation/variables when rearranging to find the inverse of a function | Composite function
Inverse function
Intersection | **Pure Year 2 Ch 2 (from GCSE and Pure Y1 Ch4,5 and 7)**
Changing the subject of an equation
Simplifying algebraic fractions
Sketching graphs
Inputting values to functions

After:
- using modulus in convergent series
- inverse trig functions |