Maths CURRICULUM MAP: Y10-11

Curriculum aims and intent	*Astrea's maths curriculum is rich in declarative, procedural and conditional knowledge. The curriculum allows scholars to gain fluency, build confidence and develop a deeper understanding of mathematics. Through its hierarchical nature, we:* *• Ensure fluency is achieved, as well as the ability to recall and apply knowledge rapidly and accurately. This is developed through carefully atomising component knowledge (**declarative and procedural**) using:* *o Procedural variation* *o Deliberate practice* *o Frequent retrieval practice* *• Allow scholars to see that mathematics is an interconnected subject by:* *o Building on prior knowledge to make explicit links and rich connections between topics* *o Providing opportunities for cumulative practice, with interconnecting ideas to allow scholars to work flexibly between different areas of mathematics.* *• Develop **conditional knowledge**, building competency to solve increasingly sophisticated problems by:* *o Decodifying a problem to identify the mathematics within it* *o Reasoning and justifying conclusions, through the use of calculations* *o Developing resilience in unfamiliar contexts, using pre-requisite known facts, without necessarily knowing the final answer* *Learning is a change in long term memory, and thus research and cognitive science has informed our curriculum, which makes use of retrieval practice as an aid to learning. We utilise regular low stakes quizzes and formative assessment to enable scholars to retrieve information.* *Our curriculum builds on previous knowledge learned at Key Stage 2, and is sequenced such that new learning is introduced and then consolidated with previous learning being interweaved throughout. Topics that are introduced in Key Stage 3 will be revisited in more depth at Key Stage 4 to ensure understanding is met. Forward-facing methods are considered at all levels to ensure that teaching approaches throughout the key stages contribute to a coherent curriculum.*
Curriculum rationale and design	This 5 year curriculum has been developed by the Astrea Maths Central Team, in conjunction with Heads of Maths and the wider Astrea Maths Subject Community. As a team, we have looked at the best practice of several maths curricula, including those used across a variety of MATs (White Rose, United Learning, Ark, OAT maths, Inspiration Trust, Discovering Mathematics, Mercia Learning Trust) and developed our curriculum based on each of the best features of these. The Astrea 5-year curriculum has been divided into five overarching strands: Number (N), Algebra (A), Geometry & Measures (G), Proportional Reasoning (P) and Statistics & Probability (S). Complete coverage would take a student from the start of Year 7 to full coverage of all content at Higher GCSE by the end of Year 11. The curriculum starts to diverge slightly in the second half of the Y10 Spring Term, then more notably towards the end of Y10 and into Y11. This is to ensure all scholars can access all areas of maths and have time to develop their skills before limiting their entitlement to Higher maths.

In KS3, there are 12-13 weeks per term allocated to allow for 3 flex weeks per year. These flex weeks can be used at any time and the placement of these is for individual schools or teachers to decide, based on their school holidays, calendared events or an identified need for consolidation.

The bullet points below gives an insight into the specific sequencing of topics within a Key Stage. This is an exemplar, and this process has been followed for all sequences throughout the 5 year SOL:

- The first unit in Y7, Applications of Numeracy, is placed here to ensure that scholars have solid foundational knowledge from KS2 and to build on this knowledge for scholars to understand the structure of number. In this unit, we explore applications of place value - median, powers of 10, standard form and working with different bases. We have also included rounding here, to emphasise how rounding relates to place value. Rounding is then revisited in Y8 to include estimation and error intervals.
- Within this unit, 'Addition and Subtraction' topics explore applications of this KS2 strand, including perimeter, frequency trees and addition and subtraction in standard form. We want our scholars to see mathematics as a series of interconnected ideas. Bringing in geometry and statistics strands of mathematics into the addition and subtraction unit allows this to happen.
- Similarly, 'Multiplication and Division' also explores applications of this KS2 strand, such as area, mean, primes, order of operations, squares and cubes. Within order of operations, we build in decimals (as four operations with decimals has been covered prior to this subtopic). Note that multiplication and division in standard form isn't included at this stage, as scholars have not yet been taught laws of indices. Standard form is revisited again in Y9 in further depth, to review the standard form subtopics covered in Y7 and build on these to include multiplication and division.
- As the subtopic 'Order of operations' has been covered prior to the 'Addition and Subtraction of Fractions' topic in Y7, order of operations can be interwoven into the addition and subtraction of fractions (questions such as $2/3 + 4 \times 5$). Questions involving multiplication and division of fractions are not explored at this stage, as this is yet to be taught. However, this allows for great retrieval practice of order of operations again in Y8, when multiplication and division of fractions is introduced.
- Introducing scholars to algebra at the end of the Spring Term allows for all previous content covered to be interwoven into this booklet. For example: algebra with fractions; algebra with order of operations; factors and multiples for expanding and factorising (up to cube powers, as this is all that has been taught up to this point). We do not go as far as solving at this stage, as we want scholars to master algebraic manipulation first in its entirety, reducing cognitive overload when it comes to solving in Y8. Sequences directly follows algebraic manipulation, to build on the newly acquired substitution knowledge. Notice that question types such as 'is this number in the sequence' aren't included here, as some of these questions require knowledge of solving equations. As we explore solving equations in Y8, these types of sequence questions are fed into this booklet, to retrieve prior knowledge of sequences and build on this with the skills scholars have just developed around solving equations.
- Y7 Probability directly follows FDP, so that probabilities can be expressed as fractions, decimals or percentages and scholars can practice working flexibly between these within a different context.
- Once we reach Y8, the first booklet 'Developing Number Sense' follows directly on from Venn diagrams pre-Summer. Scholars will explore HCF and LCM using prime factorisation in Venn diagrams, again retrieving then building on prior knowledge. This booklet has been placed before 'Equations and Inequalities', so that knowledge of squares and roots can be incorporated into solving equations and laws of indices can be applied to expanding and factorising with more complex powers.
- The Y8 'Equations and Inequalities' booklet incorporates applications of solving. This allows scholars to see mathematics as a series of connected ideas, and allows opportunities for retrieval of Y7 content such as angle properties, polygons and sequences.
- We have placed rounding, estimation and use of a calculator prior to area and circumference of circles, so that answers can be correctly rounded to a number of decimal places or significant figures and so that students can practise using a calculator before exploring new content with circles, to reduce cognitive load.

	• An example of where there is no explicit hierarchy is between solving equations and angles on parallel lines. As scholars learned about angle properties and angles in polygons in Y7, we decided to place 'Equations and Inequalities' in Y8 before angles in parallel lines. This is so the Y7 angle knowledge can be fed into solving equations within 'Equations and Inequalities', then solving equations knowledge can be fed-forward to 'Angles in Parallel Lines' for two different retrieval opportunities and spaced practice. The curriculum has been developed and sequenced to work for all - building seamlessly on previous knowledge to guarantee long-term learning. Scholars should attain proficiency, familiarity, and increased confidence through the interleaved recall of useful facts and methods throughout.
Assessment	Teachers use formative assessment strategies daily to determine the topic depth. Since curriculum materials are provided to complement the scheme, there is confidence that pupils are receiving lessons that provide opportunities for fluency, reasoning and problem solving. Opportunities for interweaving are regularly provided to retrieve information from other topic areas to place it solidly into long-term memory, enabling connections to be made between different parts of the curriculum. On-going evaluation of scholars' knowledge and understanding is undertaken through regular live marking and frequent low stakes assessments. These provide the teacher with responsive teaching opportunities to unpick misconceptions should they arise, or better still, prevent them from forming in the first place. End of booklet quizzes completed to allow scholars the opportunity to demonstrate the learning that has taken place, provide teachers with information on the current understanding of students and identify whether there are gaps or misconceptions present. Formal summative assessments take place twice a year in KS3, at the end of Y10 and in Autumn and Spring of Y11.

Year	Autumn 1		Spring 1		Summer 1	
Year 10 Core	Linear algebra, with single variables	Core Number Skills Core statistics	Pythagoras's Theorem Fractions, Decimals and Percentages	2D and 3D shape	Graphs and sequences Ratio, proportional reasoning, scale and measure	Constructions and Loci Arcs and sectors
Year 11 Core	Further algebra: Simultaneous equations, inequalities	Core angle skills Vectors and trigonometry Core probability	Transformations Statistics including tables, sampling	Consolidation and revision		
Year 10 Higher	Quadratic expressions and equations; Higher Number	Statistics – averages and summarising data; Surds	Further trigonometry and Pythagoras's theorem Higher Fractions, Decimals, Percentages	Further Probability Further Geometry	Sequences and advanced graphs	Advanced ratio and proportion Circle theorems
Year 11 Higher	Advanced algebra: functions, proof, iteration Further statistics	Constructions, Transformations; Interpreting advanced graphs	Vectors, congruence, trigonometric graphs	Consolidation and revision		

“Core” Pathway (Foundation and Crossover)

Year 10 Core	Subject: Maths	Unit title: Linear Algebra	Term: Autumn 1
Procedural knowledge: • Learn conventions of algebraic notation • Simplify by collecting like terms • Simplify multiplicative algebra • Expand single brackets • Solve 1 step equations • Solve multi step equations • Form expressions from context • Form and solve equations with perimeters and angles • Form and solve equations from worded problems • Solve equations with brackets • Form and solve equations with area • Solve equations with unknowns on both sides • Plot quadratics • Expand double brackets • Factorise simple quadratic expressions	**Vocabulary** Variable Term Expression Coefficient Like terms Substitution Expanding Factorising Equation Integer solutions Non-integer solutions Multi-step equations Isolating the variable Inverse operation	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- This unit recaps core algebraic declarative and procedural knowledge from KS3 with a view to overlearning key knowledge and promoting fluency.
- Algebra is crucial to success as a developing mathematician and significant time is dedicated to this important foundation
- Later in the unit, new content is covered which includes crossover topics and some gateway topics to higher-tier
- This unit’s foundations are revisited throughout KS4, in shape and ratio topics and especially at the start of Year 11 where simultaneous equations are covered

Links to the national curriculum:

Astrea’s KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a ‘crossover’ with Higher-tier content.
The Higher pathway fully covers all content from the programme of study.

Year 10 Core	Subject: Maths	Unit titles: Core Number Skills; Core statistics	Term: Autumn 2
Procedural knowledge: • Identify the place value of a digit for integers and decimals • Order integers, decimals and negatives • Round to the nearest integer, 10, 100, 1000 or given decimal place • Round to given significant figure • Carry out estimations • Use written methods to carry out the 4 main operations • Operations with negative numbers • Multiplying and dividing decimals • Use of a calculator • Find multiples, factors, LCMs and HCFs • Carry out prime factorization • Know and find squares, cubes and roots • Know and use the laws of indices • Convert from standard to ordinary form and back again • Operations with numbers in standard form • Understand and find upper and lower bounds and error intervals • Representing univariate data • Finding the 3 main measures of central tendency and range • Constructing Stem and Leaf diagrams	**Vocabulary** Integer Place Value Rounding Decimal Place Ascending Descending Negative Number Estimation Order of Operations Error Interval Lower bound Index Base Standard Form Averages Mean Median Mode Range Discrete data Continuous data	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- The number parts of this unit consolidate and overlearn the key foundational number skills from KS3. Later in the unit, the use of prime factorization to identify LCMs and HCFs, the work with standard form and limits of accuracy all cover required KS4 content.
- The statistics lessons consolidate and build on content first encountered at KS3 but deepen to apply context as well as stretching the mathematical requirements, for example with reverse mean problems.
- As with the prior algebra unit, the skills and knowledge in this unit is foundational to virtually all later topics in KS4 Core or Higher pathways.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Core	Subject: Maths	Unit title: 2D Shape and Pythagoras's Theorem; Fractions and Decimals	Term: Spring 1
Procedural knowledge: • Finding perimeter of regular and irregular polygons • Finding perimeters of rectangles and parallelograms • Finding perimeters of isosceles triangles • Finding perimeter of compound shapes • Finding circumference of circles • Finding the radius when given a circumference • Knowing and applying Pythagoras: missing hypotenuse or shorter side • Applying Pythagoras's theorem in context • Simplify fractions • Converting between improper and mixed numbers • Finding equivalent fractions • Adding and subtracting fractions • Multiplying fractions • Dividing fractions • The 4 operations with mixed numbers • Fractions on a calculator • Converting between decimals and fractions • Converting between percentages and decimals • Converting between percentages and fractions • Ordering Fractions, Decimals and Percentages • Finding percentages of amounts (with and without calculator) • Percentage increase and decrease • One number as a percentage of another	**Vocabulary** Perimeter Polygon Irregular polygon Regular polygon Parallelogram Trapezium Isosceles Compound Radius Diameter Circumference Pythagoras's Theorem Triangle Right angled triangle Hypotenuse Numerator Denominator Equivalent Reciprocal Percentage Simple Interest Compound interest Compound measure Multiplier	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

• Finding percentage change • Simple and compound interest • Working with reverse percentage problems		

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- The 2 D shape topic focusses on measures of length, decoupling from area (which comes later in the SOL). This allows pupils to learn these skills to mastery without the added complexity of choosing whether problems concern 2 or 3 dimensions. Significant content is consolidation from KS3 but new areas of mathematical knowledge are taught including working backwards to missing dimensions (requiring skills of solving linear algebra from Unit 1) and applications of Pythagoras in real life and problem solving.
- The declarative knowledge in this topic supports access to the later 2D (area) and 3D shape topics. Being fluent in the terminology of this unit reduces cognitive load as those more complex areas are covered.
- The FDP topic is foundational in a similar way to Units 1 and 2. It consolidates and deepens understanding of these key topics from KS3 as well as deepending (for example with reverse percentage problems). The skills learnt in this topic are relied on constantly in shape, proportional reasoning, statistics and probability topics later in KS4.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Core	Subject: Maths	Unit title: 2D shape (area) and 3D shape	Term: Spring 2
Procedural knowledge: • Find areas of rectangles and parallelograms • Find areas of triangles • Find area of a trapezium • Find areas of compound shapes • Areas of triangles • Area of circles • Area of sectors • 3D shape naming and labelling • Understand plans and elevations • Volume and surface area of cubes and cuboids • Volume and surface area of prisms • Volume and surface area of cylinders • Volume and surface area of pyramids and cones • Volume and surface area of spheres	**Vocabulary** Area Perpendicular height Volume Surface area Face Edge Vertex, vertices Prism Cross section Cylinder Pyramid Cone Sphere	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:
Why this and why now? How does this speak to what came before it and what will come after it?

- There are strong links with the previous 2D shape unit but the passing of time will help pupils decouple problems of area from those of perimeter. Later the questions will be recombined as part of method selection exercises.
- Some content is consolidation of crucial geometry from KS3, but new crossover topics are also covered, particularly those covering sectors, pyramids, cones, cylinders and spheres.
- For working backwards problems, we rely on learning of solving equations from Unit 1

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Core	Subject: Maths	Unit title: Graphs and sequences Ratio, proportional reasoning, scale and measure	Term: Summer 1
Procedural knowledge: • Describe and continue sequences of diagrams • Identify and continue Linear sequences • Generate linear sequences using term to term rules • Generate sequences given the nth term • Find the nth term of a linear sequence • Recognise and continue other common sequences • Understand and give Coordinates • Find Midpoints of Line Segments • Plot Straight Lines • Find and understand Gradients of Straight Line Graphs • Understand and work with the Equation of a Straight Line • Understand equations Horizontal and Vertical Lines • Simplifying Ratios • Working with Unit Ratios • Using bar models to represent ratios • Understanding ratios as fractions • Sharing amounts in a ratio • Working with Recipes and Exchange Rates • Understand Inverse Proportion • Identify Congruent Shapes • Identify Similar Shapes and work with scale factors • Know the crucial units of measurement • Conversions of metric units • Work with scale drawings • Understand and calculate Speed, Distance & Time	**Vocabulary** Sequence Linear sequence Arithmetic sequence Term Term to term rule Position to term rule Co-ordinates Linear graph Substitution Gradient Equivalent Notation Quantity Rate Ratio Unitary Best Buy Direct Proportion Measurement Metric units Imperial units Unit of measurement Scale Scale drawing Scale factor Ratio Speed Distance Time Density Pressure	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

• Understand and calculate Density and Pressure		

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- Graphs and sequences link strongly with prior foundations in number and algebra units, and the teaching of these units now will help consolidate the learning earlier in the year as well as demonstrate how crucial those foundational topics are.
- Ratio and proportion are crucial to over-learn at this stage and link subsequently to many other areas including probability and statistics. Covering them now also enables explicit links to be made with the prior geometry units which retrieves that crucial knowledge in a new context.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Core	Subject: Maths	Unit title: Constructions and Loci Arcs and sectors	Term: Summer 2
Procedural knowledge: • Effective use of compass and protractor • Constructing angle and line bsectors • Constructing Triangles • Working with Loci problems • Calculating the Circumference of circles • Finding perimeters of part-circles • Finding Arc Lengths	**Vocabulary** Construction Bisect Perpendicular Bisector Angle Bisector Locus Equidistant Angle	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:
Why this and why now? How does this speak to what came before it and what will come after it?

- This is a shorter unit reflecting that end of year assessments impact on this half term. Practically, some of the prior proportional reasoning unit will also be taught this half term (see detailed curriculum overview/map for finer timings)
- Constructions date back to Euclid and are one of the foundational elements of maths, considered amongst the most beautiful by many professional mathematicians. There are strong links with preceding geometry, as well as looking forward to topics in Y11 such as transformations.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 11 Core	Subject: Maths	Unit title: Further Algebra	Term: Autumn 1
Procedural knowledge: • Solving linear equations including unknowns on boths sides • Inequality notation and mapping on a number line • Solving linear inequalities • Rearranging formulae • Solving simultaneous equations graphically and algebraically • Forming and solving simultaneous equations	**Vocabulary** Constant Variable Equation Inequality Formula Subject Solve Balancing Simultaneous Equations Elimination Method Substitution Method	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- This unit covers the remainder of algebraic topics from the programme of study up to and including crossover topics such as solving of linear simultaneous equations.
- Success in this unit relies fundamentally on the strong building blocks in algebra in KS3 and Unit 1 of Year 10. Appropriate time has passed for the recap and consolidation of key foundational topics to be worthwhile and this is more likely to lead to a permanent change in long term memory for pupils.
- The rearranging of formulae links with many of the higher end Foundation topics such as 'working backwards' to missing dimensions in shape, or substitution and solving into problems involving compound measures.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 11 Core	Subject: Maths	Unit title: Core angle skills Vectors and trigonometry; Core probability	Term: Autumn 2
Procedural knowledge: • Angles in a Right Angle • Angles on a Straight Line • Angles around a Point • Vertically Opposite Angles • Angles in a Triangle • Angles in a Quadrilateral • Sum of Angles in a Quadrilateral • Angle Rules for Special Quadrilaterals • Angles in Parallel Lines • Corresponding Angles • Alternate Angles • Co-interior Angles • Algebraic Problems • Measuring Bearings • Drawing Bearings • Calculating Bearings • Vectors: Definition & Notation • Multiplying Vectors • Adding and Subtracting Vectors • PARALLEL VECTORS • VECTOR GEOMETRY • Trigonometry - Building Blocks • Calculating a missing length • Calculating a missing angle • Applications of Trigonometry • Choosing between Pythagoras and Trigonometry • Solving Problems with Pythagoras and Trigonometry • Bearings with Pythagoras' Theorem & Trigonometry • Theoretical Probability	**Vocabulary** Angles on a straight line Angles around a point Interior Angle Exterior Angle Triangle Quadrilateral Regular Polygon Irregular Polygon Parallel Perpendicular Transversal Vertically opposite Alternate Corresponding Co-interior Bearings Direction Magnitude Vector Column Vector Resultant vector Scalar Parallel Trigonometry Hypotenuse Adjacent side Opposite side Probability Events Outcomes Trial Random	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

• Relative Frequency (Experimental Probability) • Listing Outcomes and Sample Space diagrams • Two-Way Tables • Frequency Trees • Venn Diagrams • Combinations (Product Rule for Counting) • Probability Trees	Biased Mutually Exclusive Experimental Probability Expected Probability Venn Diagram Set Notation Union & Intersection	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- This unit consolidates foundational angles knowledge from KS3 before building on it in linking with applications such as bearings and trigonometry. Trigonometry is re-covered since mainly the basic procedural elements will have been the focus when covered in Year 9.
- Basic vectors knowledge links with the final unit (transformations).
- Probability is another area not consolidated since Key Stage 3 so it is important to do so now. This unit recaps all key procedural and declarative knowledge from Key Stage 3 before stretching pupils understanding in application, for example constructing and interpreting tree diagrams.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 11 Core	Subject: Maths	Unit title: Transformations; Statistics including tables, sampling	Term: Spring 1
Procedural knowledge: • Constructing and interpreting frequency polygons • Constructing and interpreting scatter graphs • Completing and describing reflection • Completing and describing Translation • Completing and describing Rotation • Completing and describing Combined Transformations • Completing and describing Positive and Fractional Enlargements	**Vocabulary** Line of Best Fit Correlation Object Image Transformation Rotation Centre of rotation Reflection Line of reflection Translation Enlargement Centre of Enlargement Ray Length (Linear) Scale Factor	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:
Why this and why now? How does this speak to what came before it and what will come after it?

- Transformations are linked to the prior unit of vectors. They are low leverage and therefore taught towards the end of the course.
- The final statistics knowledge has been decoupled from that taught in Year 10 and this allows spaced retrieval of the concepts and knowledge taught then, alongside the new content.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Higher Tier Pathway

Year 10 Higher	Subject: Maths	Unit title: Quadratics; Higher Number	Term: Autumn 1
Procedural knowledge: • Expanding triple brackets • Recap: Factorising: Monic Quadratics • Factorising Difference of Two Squares • Solving Quadratic Equations by Factorising • Solving 'disguised' quadratic equations • Factorising Non monic Quadratics • Solving Non monic Quadratic Equations by Factorising • The Quadratic Formula • Quadratic Inequalities • Completing the Square • Sketching Quadratic Curves • Rounding to nearest integer, or decimal places • Rounding to Significant Figures • Estimation • Multiplying and Dividing Decimals • Using a Calculator Efficiently • Multiples and Factors • Lowest Common Multiple and Highest Common Factor • Prime Numbers and Prime Factorisation • HCF and LCM with Prime Decomposition • Squares, Cubes and Roots • Positive Indices and Laws of Indices • Zero and Negative Indices • Fractional Indices • Solving Equations with Indices • Standard form • Limits of accuracy	**Vocabulary** • Quadratic expression • Quadratic equation • Factorise • Quadratic formula • Completing the square • Parabola • Inequality • Integer • Place Value • Rounding • Decimal place • Estimation • Order of Operations • Index • Indices • Base • Square root • Index • Indices • Standard Form • Mantissa • Lower bound • Upper bound • Error Interval	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- This unit recaps core algebraic declarative and procedural knowledge from KS3 with a view to overlearning key knowledge and promoting fluency.
- Algebra is crucial to success as a developing mathematician and significant time is dedicated to this important foundation
- Quadratics are key to success at GCSE Higher tier maths and beyond and so this is taught now to enable frequent retrieval, recall and links with subsequent topics (e.g. geometry, probability)
- The number topics of this unit retrieve and overlearn content from KS3 and then build further for example by learning about fractional indices and changing the base of power expressions in order to solve equations

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Higher	Subject: Maths	Unit title: Statistics – averages and summarising data; Surds	Term: Autumn 2
Procedural knowledge: • AVERAGES & RANGE FROM LISTED DATA • Problem Solving with Averages • AVERAGES & RANGE FROM UNGROUPED FREQUENCY TABLES • AVERAGES FROM GROUPED FREQUENCY TABLES • Bar Charts • Line Graphs • Pie Charts • Stem & Leaf Diagrams • Understanding and Simplifying Surds • Multiplying and Dividing Surds • Adding and Subtracting Surds • Expanding Single Brackets with Surds • Rationalising Denominators (Basic) • Expanding Double Brackets with Surds • Rationalising Denominators (Using the Conjugate)	**Vocabulary** • Mean • Median • Mode • Range • Discrete • Continuous • Bar Chart • Pie Chart • Line Chart • Stem and Leaf • Index • Base • Integer • Square number • Cube number • Square root • Cube root • Surd • Irrational Number • Rational Number • Rationalise	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- The data and statistics unit retrieves key foundational content before developing deeper understanding, for example by working with reverse means and averages from grouped frequency tables
- Surds is a novel concept and thus is covered in depth, first retrieving key knowledge around powers and roots and fractional operations.
- Both of these units link with later algebra topics. Surds is foundational to later trigonometry units as well as success at Level 3 maths

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Higher	Subject: Maths	Unit title: Further trigonometry and Pythagoras's theorem Higher Fractions, Decimals, Percentages	Term: Spring 1
Procedural knowledge: • Pythagoras' Theorem - Recap • Applying Pythagoras' Theorem to problem solving • Pythagoras' Theorem and isosceles triangles • Pythagoras' Theorem in 3D • Right Angle Trigonometry: Recap and 3D • The Sine Rule • The Cosine Rule • The general area of a triangle • Fractions: Core Skills – Prior Checks and Consolidation: • Recurring Decimals to Fractions • Decimal-Fraction Equivalence and Conversions – Prior Checks and Consolidation • Ordering Fractions, Decimals and Percentages • Core Applications of Percentages – Prior Check and Consolidation • Finding Percentage Changes (Non calc) • Finding Percentages of Amounts (all non calc questions) • Percentage increase and decrease (calculator) • Finding Percentages of Amounts (all calculator questions) • Simple Interest • Compound Interest • Reverse Percentages	**Vocabulary** • Hypotenuse • Adjacent side • Opposite side • Pythagoras' Theorem • Right angle • Trigonometry • Sine • Cosine • Tangent • Numerator • Denominator • Equivalent • Simplify • Improper fraction • Mixed number • Reciprocal • Interest • Percentage • Proportion • Quantity • Simple interest • Compound interest • Multiplier	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	
Links to other units: Why this and why now? How does this speak to what came before it and what will come after it?			

- The retrieval and fluency in Pythagoras allows greater depth in this crucial topic, for example by application in 3 dimensions
- Advanced trigonometry topics rely on prior foundation in right angled trigonometry
- Fraction, decimal and percentage fluency is crucial foundational knowledge and this unit deepens for example by applying in the context of compound interest

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Higher	Subject: Maths	Unit title: Further Probability Further Geometry	Term: Spring 2
Procedural knowledge: • RECAP: Theoretical Probability • RECAP: Relative Frequency (Experimental Probability) • RECAP: Listing Outcomes and Sample Space diagrams • RECAP: Two-Way Tables • Basic Theoretic Probability, Relative Frequency ,2 Way Tables • Venn Diagrams and notation • Combinations (Product Rule for Counting) • Tree diagrams (independent events) • Tree Diagrams (dependent/conditional events) • Algebraic Probability (including Tree Diagrams) • Area of Sectors • 3D Shapes, Plans and Elevations • RECAP: Volume and Surface Area of Cubes & Cuboids • Volume and Surface Area of Prisms • Volume and Surface Area of Cylinders • Volume and Surface area of Pyramids • Volume and Surface area of Cones • Volume and Surface Area of Spheres	**Vocabulary** • Probability • Events • Outcomes • Trail • Random • Biased • Mutually Exclusive • Experimental Probability • Expected Probability • Venn Diagram • Set Notation • Union & Intersection • Perimeter • Compound • Radius • Diameter • Circumference • Volume • Surface Area • Regular • Perpendicular height • Face • Edge • Vertex • Prism • Cross section • Cylinder • Pyramid • Cone • Sphere	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	
Links to other units:			

Why this and why now? How does this speak to what came before it and what will come after it?

- This unit builds on KS3 probability and geometry topics. More advanced elements of it rely on the prior algebra, number and Pythag/trig units taught earlier in Y10

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Higher	Subject: Maths	Unit title: Sequences and advanced graphs	Term: Summer 1
Procedural knowledge: • RECAP: Find the nth term of a linear sequence • Finding the nth term of a quadratic sequence • Recognise and continue other sequences • Working with geometric sequences • RECAP: Equations and Graphs • RECAP: Gradients of Straight Line Graphs • The Equation of a Straight Line • Algebraic Equations of Straight Lines • Further Algebraic Equations of Straight Lines • Parallel and perpendicular lines • The Equation of a Circle	**Vocabulary** • Sequence • Arithmetic sequence • Geometric sequence • Term • Term-to-term rule • Position-to-term rule • nth term or • General term • Substitution • Quadratic Sequence	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:

Why this and why now? How does this speak to what came before it and what will come after it?

- Straight line graphs, gradients and linear nth terms are consolidated from KS3 prior to building on, for example with more advanced work in the Cartesian plane and finding nth term of quadratic sequences.
- Equations of circles and straight line graphs are important prerequisites to success in later units including graph transformations, and solving equations graphically.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 10 Higher	Subject: Maths	Unit title: Advanced ratio and proportion; Circle theorems	Term: Summer 2
Procedural knowledge: • Simplifying Ratios • Ratios in the form 1 : n and n : 1 • Sharing Ratios • Compound Ratios • Direct Proportion • Best Buy Problems • Inverse Proportion Problems • Algebraic Direct Proportion • Algebraic Inverse Proportion • Scale • Speed, Distance, Time • Other Compound Measures • Congruent and similar shapes • Area and volume of similar shapes • Angles at the Centre and the Circumference • The angle in a Semi Circle is 90 degrees • Angles in the same segment are equal • Cyclic quadrilaterals • Angle between tangent and a radius • Tangents from a given point • Radius that meets a chord • Alternate Segment Theorem • Circle Theorem Proofs	**Vocabulary** • Equivalent • Notation • Quantity • Rate • Ratio • Unitary • Best Buy • Direct Proportion • Inverse Proportion • Congruent • Similar • Enlargement • Corresponding Sides • Length (Linear) Scale Factor • Area Scale Factor • Volume Scale Factor • Vertex / Vertices • Arc • Bisect • Chord • Circumference • Congruent • Hypotenuse • Midpoint • Perpendicular • Pythagoras' Theorem • Quadrilateral • Tangent • Theorem	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	
Links to other units: Why this and why now? How does this speak to what came before it and what will come after it?			

- Builds on KS3 ratio and proportional reasoning and earlier KS4 work on linear graphs and similarity. Links forward to trigonometry and vectors, where proportional reasoning underpins scale factors and transformations.
- Circle theorems connect to geometric reasoning in constructions and proofs later in the course.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 11 Higher	Subject: Maths	Unit title: Advanced algebra: functions, proof, iteration Further statistics	Term: Autumn 1
Procedural knowledge: • Rearranging Formulae/ Changing the Subject • Recap/ Prior Knowledge Quiz: Solving Quadratic Equations • Simultaneous Equations – elimination and graphical solving • Recap: Solving Simultaneous Equations by Elimination • Worded Simultaneous Equations • Solving Simultaneous Equations using Substitution • Quadratic Simultaneous Equations • Algebraic Fractions – Manipulation and Simplifying • Algebraic Fractions – Solving (including Quadratics) • Functions • Iteration 1: Recurrence Relationships • Iteration 2: Estimating Solutions • Algebraic Proof • Capture Recapture • Frequency Polygons • Scatter Graphs • Quartiles • Box Plots • Cumulative Frequency Graphs • Histograms	**Vocabulary** • Fraction • Numerator • Denominator • Function • Inverse Function • Composite Function • Formula • Iteration • Solve • Quadratic simultaneous equations • Constant • Variable • Linear Function • Simultaneous Equations • Elimination Method • Substitution Method • Median • Upper/Lower Quartile • Interquartile Range • Line of Best Fit • Correlation • Cumulative • Frequency Density • Histogram	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	
Links to other units: Why this and why now? How does this speak to what came before it and what will come after it? • Extends prior KS3 and KS4 algebraic manipulation and equation solving. • Proof builds on earlier work with identities and factorisation, and prepares for formal reasoning in geometry and number.			

- Functions and iteration link forward to sequences, graph interpretation, and problem-solving in real-world contexts.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 11 Higher	Subject: Maths	Unit title: Constructions, Transformations; Interpreting advanced graphs	Term: Autumn 2
Procedural knowledge: • Completing and describing reflection • Completing and describing Translation • Completing and describing Rotation • Completing and describing Combined Transformations • Completing and describing Positive and Fractional Enlargements • Completing and describing negative enlargements • Identifying invariant points • Estimating gradients of curves • Interpreting gradients of curves as rates of change • Estimating areas under curves using trapezium rule	**Vocabulary** Object Image Transformation Rotation Centre of rotation Reflection Line of reflection Translation Enlargement Centre of Enlargement Ray Length (Linear) Scale Factor	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:
Why this and why now? How does this speak to what came before it and what will come after it?

- Connects to earlier KS3 work on symmetry and basic transformations, and KS4 units on coordinates and linear graphs.
- Supports topics in loci, congruence, and trigonometric graphs, as well as underpinning problem-solving in geometry and algebraic modelling.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.

Year 11 Higher	Subject: Maths	Unit title: Vectors, congruence, trigonometric graphs; graph transformations, exponential graphs	Term: Spring 1
Procedural knowledge: • Vectors: Definition & Notation • Multiplying Vectors • Adding and Subtracting Vectors • Parallel vectors as a scalar multiple of another vector • Vector geometry • Proof with vectors • Trigonometric graphs – shape, magnitude and period • Solving trig equations with graphs • Sketching and interpreting exponential graphs • Recognising and plotting reciprocal graphs • Understanding and identifying the main graph transformations (with function notation)	**Vocabulary** Direction Magnitude Vector Column Vector Resultant vector Scalar	**Teaching Sequence:** • Core Knowledge Takeaway • Unit booklets	

Links to other units:
Why this and why now? How does this speak to what came before it and what will come after it?

- Builds on KS3 and KS4 work on coordinates, transformations, and ratio.
- Vectors link to previous units on scale factors and similarity, while congruence connects to earlier geometric reasoning and proofs.
- Trigonometric graphs extend prior trigonometry and prepare for advanced graph interpretation and modelling.

Links to the national curriculum:

Astrea's KS4 Aligned Curriculum meets closely the content of the national curriculum. The Core pathway covers content that the programme of study states should be taught to all pupils. It also includes content that is considered a 'crossover' with Higher-tier content.

The Higher pathway fully covers all content from the programme of study.