

### Curriculum Intent

*'Pure mathematics is, in its way, the poetry of logical ideas.'*  
– Albert Einstein

It is the intention of the St Cuthbert's Mathematics department to deliver a curriculum that is knowledge based and ambitious, designed to meet the needs of all our students. We aim to create an aspirational high-achieving culture while also considering our students individual needs and learning styles thus enabling all students to experience success.

We aim to develop the skills set out in the National Curriculum to promote an appreciation of Mathematics as a creative and highly transferable discipline which will aid students in their further learning, apprenticeships, or employment. We do not limit the life chances of any student as we offer a linear scheme in KS3 with all students having the full National Curriculum delivered to them.

We aim to provide students with a sense of enjoyment and curiosity about the subject together with an appreciation of the beauty and power of Maths in different cultures. We endeavour to provide support across a range of topics with an emphasis on problem-solving and developing Mathematical fluency through a mastery approach, making sure that all learning is embedded in long-term memory. This will build resilience and enable students to recall information to use in a variety of new learning opportunities as well as real life situations.

### KS3 Y7, Y8 and Y9 follow Whiterose Maths.

Why whiterose maths...

- The curriculum is built with mastery at its core. **Teaching for mastery:** pedagogical practices that keep the class working together on the same topic so that all pupils master it and some gain greater depth of proficiency and understanding
- One tier with teachers differentiating accordingly depending on the ability of students in their classes. This makes sure that no student is at a disadvantage when tiering decisions are made at the start of Y10.
- It allows students to build upon previous knowledge and secure a deep understanding. Lessons and topics are carefully sequenced to build understanding.
- All lessons promote small steps that enable students to secure knowledge before moving on. There is an emphasis on spending longer on topics to learn to a deeper level rather than skim over topics. Its depth of knowledge and not breath.
- Emphasis on using concrete materials such as algebra tiles so students can visualise and then secure knowledge long-term. This can be of real benefit to our SEND students.
- It promotes interleaving at all stages with resources having these built in throughout. This again promotes long term learning.
- All the KS3 national curriculum is covered. Throughout the key stage topics are signposted so students and staff are aware when this has been covered before.
- Topics are revisited throughout Key Stage which promotes long term learning. Flashbacks are used to recall prior knowledge,
- Throughout new learning emphasis is also made to embed prior knowledge.



### KS3 Year 7, 8 and 9

#### Year 7 sequencing

Autumn	Algebraic Thinking			Place Value and Proportion		
	Sequences	Understand and use algebraic notation	Equality and equivalence	Place value and ordering integers and decimals	Fraction, decimal and percentage equivalence	
Spring	Applications of Number			Directed Number	Fractional Thinking	
	Solving problems with addition & subtraction	Solving problems with multiplication and division	Fractions & percentages of amounts	Four operations with directed number	Addition and subtraction of fractions	
Summer	Lines and Angles			Reasoning with Number		
	Constructing, measuring and using geometric notation	Developing geometric reasoning		Developing number sense	Sets and probability	Prime numbers and proof

- Starting with Algebraic Thinking is new and exciting for our Y7 students, as it welcomes them to “big school” with a new topic that will have been unseen in primary. These skills fundamentally underpin many areas in maths and these ideas are interleaved in upcoming topics so starting with these are sensible.
- Place Value and Proportion, Application of Number and Fractional Thinking are all topics that have been covered in Primary to some level and covering them early in Y7 and eradicating any misconceptions that may be there is essential if students are to progress. Like Algebraic Thinking, these topics are interleaved throughout the next 5 years of learning. There are also links made between multiplication and area, again promoting area at all stages.
- Within these number topics Directed Number will be new to students and again very important to cover early as it is interleaved throughout. This concept of applying the 4 operations to negative numbers can easily be misunderstood eg...”two negatives give a positive” so perfecting this early in Y7 will set our students up for success in future topics.
- Moving onto Lines and Angles gives students a change following a lengthy time spent on number content. KS2 work is quickly recapped before new learning begins with more formalised terminology for angles and interleaving these with construction of pie charts. Having covered Algebraic Thinking already some angle questions will now involve creating and solving equations.
- Year 7 concludes with Reasoning of Number. Developing number sense is a new mathematical concept to teach and can inspire students to see numbers in an exciting way that can link all parts of maths to break down some misconception barriers. Sets and Probability also offer some new learning for students as does Product of Prime Numbers in the last block. This is then interleaved back to HCF and LCM in Application of Number.



### Year 8 sequencing

Autumn	Proportional Reasoning			Representations		
	Ratio and scale	Multiplicative change	Multiplying and dividing fractions	Working in the Cartesian plane	Representing data	Tables & Probability
Spring	Algebraic techniques			Developing Number		
	Brackets, equations and inequalities		Sequences	Indices	Fractions and percentages	Standard index form
Summer	Developing Geometry			Reasoning with Data		
	Angles in parallel lines and polygons	Area of trapezia and circles	Line symmetry and reflection	The data handling cycle		Measures of location

- Y8 covers lots of new topics while at every stage embedded previous knowledge from Y7
- Ratio and Scale is a new topic for our Y8 students but interleaves with fraction work from Y7 which further embeds that knowledge.
- Multiplicative change uses further Ratio content while multiplying and Dividing Fractions allow opportunities to further revisit and embed area and improper fractions from Y7.
- Working in the Cartesian Plane is mostly new while revising directed number and linear equations.
- Representing Data concentrates on Scatter graphs which is a complete new topic while Tables and Probability pushes along further probability work from Y7, looking at more difficult concepts like sample space diagrams.
- Algebraic Techniques further expands knowledge on brackets and equations all the time linking back to creating own equations from Y7. It also introduces indices to algebra, made easier by indices being covered in powers and roots in Y7
- Work from Y7 is added to by using single multiplier for percentages and index work in use in standard form in Developing Number while the Number Sense idea is further developed by introducing metrics.
- In Developing Geometry, the angles topic is further developed by bringing in parallel lines and polygons, using easier skills covered in Y7 and more difficult areas are looked at with trapezium and circles. Transformations begin to be looked at with reflection.
- Averages are covered in depth in Reasoning with Data. Previous work in Y7 and Y8 allow this to be carried out interleaved with fractions and directed number.



### Year 9 sequencing

Autumn	Reasoning with Algebra			Constructing in 2 and 3 Dimensions		
	Straight line graphs	Forming and solving equations	Testing conjectures	Three dimensional shapes	Constructions and Congruency	
Spring	Reasoning with Number			Reasoning with Geometry		
	Numbers	Using percentages	Maths and money	Deduction	Rotation and translation	Pythagoras' Theorem
Summer	Reasoning with Proportion			Representations		
	Enlargement and similarity	Solving ratio and proportion problems	Rates	Solving problems using graphs, tables and algebra		

- Y9 covers lots of new topics while at every stage embedded previous knowledge from Y7 and Y8
- Straight line graphs are further developed, using work covered in Y8 but extending to  $y = mx + c$ . brackets and directed number are also revisited in this topic.
- Forming and solving equations follow the same principles from previous years but extend to unknowns on both sides.
- In testing conjectures students get their first real opportunity to prove answers with mathematical reasoning. A skill very much needed for future maths work both at GCSE and post 16.
- Three Dimensional Shapes focus on SA and volume, relying on knowledge from area from the previous year.
- Constructions and Congruency present new topics that students will be seeing for the first time.
- Reasoning with Number revisit and further embed knowledge on HCF and LCM, standard form and percentage work. Reverse % is introduced as is Real and Irrational numbers. Maths and Money allow opportunity for students so see financial maths and link it to bills, wage slips etc.
- Reasoning with Geometry revisits and extends angle work with algebra equations. Rotation stand as new and discrete topics as does Pythagoras theorem. Previous work and revision on indices will help with understanding on Pythagoras Theorem.
- Enlargement and Similarity are new concepts but interleave with multiplication of decimals and fractions from previous topics.
- Solving Ratio and Proportion Problems and Rates (speed etc) introduce new topics that rely on multiplication skills previously learned.
- Representations is mostly a revisit of key skills covered in the Key Stage.

### KS4 Year 10 and 11...Legacy following old 2yr KS3 and Y9 GCSE

For the academic year 2020-2021 current Y10 and Y11 students are continuing their Higher and Foundation OCR course that began at the start of their Y9. From 2020-onwards decisions on tiers will be made at the end of Y9 for students to begin their two year KS4 at Higher or Foundation at the beginning of Y10. Students will sit OCR at the end of Y11. Topics are covered matching to the tier of entry and are carefully sequenced to enable students to build upon prior knowledge. All topics are taught at a mastery level and interleaved to other areas of maths at all times. Staff are aware what has been delivered in previous year groups and their planning is adapted accordingly. ROL is used to reinforce prior knowledge and move onto new learning quickly. There is a huge emphasis on using problem solving and reasoning questioning in all year groups but especially in yr 10 and 11 where some topics may have been seen before. From 2021- onwards KS4 topics will differ following students that will have completed KS3 Whiterose.

### Y10 and Y11 Foundation Sequence

#### Unit 9 – Graphs

- These students will revisit drawing some easier graphs from their KS3 which will then progress into  $y = mx + c$  and is a coordinate on a line. Previous work on directed number and substitution will help with these topics. Good to start Y10 with an Algebraic topic as these topics will interleave with many upcoming topics.

#### Unit 10 Transformations

- This is a discreet topic that these students will be seeing for the first time. We will cover it early in Y10 to give students an easier topic following  $y = mx + c$  in the last chapter which gets quite difficult. Reflection will also require some knowledge of Unit 9 Graphs when we need to name lines of reflection.

#### Unit 11 - Ratio and Proportion

- Simple ratios will be revised from Y9 such as simplifying and sharing ratios however these will extend further by introducing fractions with ratio as well as when there are 3 ratios within one question.
- Direct proportion will also be revised from KS3 but extend to inverse proportion as well as linking proportion to graphs. As graphs are included here so good to follow reasonably soon after Unit 9.

#### Unit 12 - Right-Angled Triangles

- Quite a few Geometry topics to cover so this will be placed here in Y10. This is easily accessible to a Y10 foundation student so placed here.
- Indices will be revisited from KS3 as Pythagoras will need these. Both Pythagoras and Trig will then be covered in depth.
- This can be an easy topic to forget to and can quickly and easily be recalled in Y11 again better to cover here in Y10.



### Unit 13 – Probability

- Basic probability will have been already covered in KS3 and revised here before extending to frequency trees, Venn diagrams and tree diagrams.
- This topic needs to follow Y9 work on operations with fractions and decimals as this will be required to fully access tree diagrams.
- There are more difficult topics still to come so another reason why we will place this here and not in Y11.

### Unit 14 Multiplicative Reasoning

- Simple % work such as finding % of an amount and % change has been covered but is quickly revisited here. This then allows extension to using a single multiplier, reverse % and then compound interest.
- Speed, Density and Pressure are also covered here and would be new content for these students.
- As Speed, Density and Pressure all need to use triangle formulas have recently covered trigonometry makes sense as this skill of triangular formulas are revisited.

### Unit 15 Constructions, Loci and Bearings

- Constructions and Loci will be a new topic for these students that needs to be cover here before the end of Y11. This Geometry topic is nicely placed to break up a two large number and algebraic topics before and after it.
- Bearings is placed within the same unit and requires all knowledge of angles from Y9. These angle rules will be quickly revisited here.

### Unit 16 - Quadratic Equations and Graphs

- Multiplying and factorising single brackets will already have occurred in previous years. They will be revisited here briefly before extending to double brackets and factorising quadratics. Students often struggle with these two topics so we leave these later in the course to give them the best chance at success.
- We draw the quadratic graph here as the links can be made between expanding, factorising and drawing. This should give the students the best chance at linking these topics and thus remembering them long-term.

### Unit 17 - Perimeter, Area and Volume 2 ...start of Y11

- This is a nice topic to start Y11 with as it is difficult yet students often are very successful with it. As many algebraic topics are needed such as substituting, it can be a good way to recap these early in Y11 also.
- Area, perimeter and volume 1, concentrated on basic areas and perimeters as well as volume of non-circular prisms. That knowledge is still required but expanded upon to further develop all circles

and prism involving circles and sectors. Cones and spheres are also covered here. Substituting into formula from a previous year will be essential for students to be successful on these topics.

### Unit 18 - Fractions, Indices and Standard Form

- Basic Index laws from Y9 will be revised here thus enabling students to see standard form for the first time. This includes calculations with standard form. Previous decimal work will also have to be revisited here to aide student learning.
- Standard form and particularly calculations with standard form can be one of the more difficult foundation topics, so leaving it late in the course will be most beneficial for the students. Also as it requires much prior learning leaving it late in the course is essential.

### Unit 19 - Congruence, Similarity and Vectors

- Congruence and Similarity is yet again one of the more difficult foundation topics so it is left until the penultimate unit. So much prior knowledge from both the KS3 and KS4 course is used here, multiplying and dividing both fractions and decimals.
- Vector Arithmetic is closely linked to similarity so makes sense that it follows directly after. Prior knowledge on directed number will be revisited as is essential for students to access vector arithmetic.

### Unit 20 - More Algebra

- Unit 20 concludes the GCSE course and finishes with some of the more difficult topics. Previous learning should now make this accessible eg...
- Substitution will allow students to draw cubic and reciprocal graphs.
- Substitution and solving linear equations in Y9 will be further stretched with work on Simultaneous Equations.
- And finally, all our expanding single and double brackets as well as factorising will give students the opportunity to be successful with algebraic proof.
- The most difficult topics on foundation are simultaneous equations and algebraic proof (results plus from past GCSE's prove this) so leaving them until the end will give students the best chance at being successful.

### Y10 and Y11 Higher Sequence

#### Unit 7 - Area and Volume

- This is a nice topic to start Y10 with as it is difficult yet students often are very successful with it. As many algebraic topics are needed such as substituting, it can be a good way to recap these early in Y10 also.
- Simple area, perimeter and volume (concentrating on basic areas and perimeters as well as volume of non-circular prisms, has already been covered) This knowledge is still required but expanded upon to further develop all circles and prism involving circles and sectors. Cones and spheres are also covered here. Substituting into formula from a previous year will be essential for students to be successful on these topics.

#### Unit 8 – Transformations and Constructions

- These are discrete topics that these students will be seeing for the first time and require very little prior knowledge.
- Previous fraction work in KS3 will allow students to access all aspects of enlargement.
- Previous Graph work in Y9 will allow students to fully access reflection.
- This is one of the easier topics that students have not covered yet so it makes sense to do this early in Y10.

#### Unit 9 – Equations and Inequalities

- Multiplying and factorising single brackets will already have occurred in previous years. They will be revisited here briefly before extending to double brackets and factorising quadratics.
- Solving Quadratics will now extend further to encompass the Quadratic Formula and Completing the Square.
- Prior knowledge on substitution and linear equations will allow students to access simultaneous equations.
- Having already covered straight line graphs and  $y = mx + c$  we then move onto Solving Linear/Quadratic/Circle Sim Equation Graphically (2)
- And all previous equation work allows us to extend to solving inequalities.

#### Unit 10 Probability

- Basic probability will have been already covered and revised here before extending to frequency trees and tree diagrams. Previous fraction and decimal work is revisited and embedded further here to allow students to fully access tree diagrams, including conditional as well as understanding the “And” and “OR” rules.
- Although this topic stretches to Grade 8 and 9 students are normally successful and as the topics needed to interleave are also easy (operations with fractions and decimals) this again comes before some more difficult topics.

### Unit 11 – Multiplicative Reasoning

- Simple % work such as finding % of an amount and % change has been covered but is quickly revisited here. This then allows extension to using a single multiplier, reverse % and then compound interest.
- Speed, Density and Pressure are also covered here and would be new content for these students.
- As Speed, Density and Pressure all need to use triangle formulas have recently covered trigonometry makes sense as this skill of triangular formulas are revisited.

**From Unit 12 Onwards we are looking at higher topics only and previous knowledge from all years underpin these topics.**

### Unit 12 – Similarity and Congruence

- A deep understanding on previous topics area and volume is needed as we now look at the relationships between similarity and volumes and areas.
- Squares, cubes and their roots (KS3) will also be revisited to deepen knowledge on this topic.
- This can be a difficult topic however as there are set procedures that students can follow it is placed earlier than some of the upcoming topics.

### Unit 13 – More Trigonometry

- All higher level Trig is covered here. Sine and Cosine rules as well as area of a triangle. Prior knowledge of substitution is needed here to use these formula.
- Again this can generally be grade 8 and 9 work but students are normally successful as set rules are followed and questions are rarely abstract in nature. Thus it is placed early in the difficult graded topics.

### Unit 14 Further Statistics

- Covered in this unit is Sampling and Stratified Sampling, UQ LQ and IQR from a list of numbers and why this is useful, Cumulative Frequency and boxplots. Drawing and interpreting histograms are also covered.
- All of these topics are discrete and don't really require prior knowledge.
- Covering the last statistics topic here breaks up the two algebraic topics either side of it.

### Unit 15 Equations and Graphs

- Sim Equations with Lines meeting Quadratics and Circles and Graphing Inequalities relies on prior knowledge of  $y = mx + c$
- Multiplying Cubic Brackets and Understanding Roots relies students being able to expand a double bracket.



- Iteration relies on students being able to substitute
- These topics are all difficult and it makes sense to leave them late in the course to give students the best chance at being successful in them. Also as they all require so much prior knowledge to interleave it is essential that they are left close to the end.

### Unit 16 – Circle Theorems

- Circle Theorems are introduced here but students must recall all their angle work from KS3 and Y10. Results plus from previous years GCSEs show that this topic can be poorly answered so although the prior knowledge that is needed (angle rules) is not that difficult this topic is left until the end.
- Circle Problems with Tangents again require a deep understanding of  $y = mx + c$  and again is a grade 9 topic so to give students the best chance at being successful it is late on in the course.
- This geometric topic is also used to break up two difficult algebraic topics.

### Unit 17 – More Algebra

- Rearranging Formula is revised quickly before being extended to rearranging Formula when the subject appears more than once. This follows factorising in an earlier unit that is required knowledge for this.
- Algebraic Fractions are covered in their entirety and require recall of operations with fractions as well as expanding and factorising brackets from previous units.
- Surds are covered in their entirety with previous knowledge of square numbers, fraction work and expanding brackets all coming together to make surds accessible to students.
- Functions are introduced and again are underpinned by students recalling information on substitution, and creating and solving equations.
- And finally, all our expanding single and double brackets as well as factorising will give students the opportunity to be successful with algebraic proof.
- All topics in this unit are grade 8 and 9 in nature so are left close to the end to give students the best chance of success.
- We also leave these algebraic topics to the end of the course as they are expected knowledge for any students doing A level and a big part of Core 1. Covering them here lessens the time between them been seen at the end of GCSE and the start of Alevel.

### Unit 18 – Vectors and Geometric Proof

- Vector Arithmetic will also be seen by these students for the first time but having already covered directed number this will make this very accessible. An easy topic but is left until now as it closely relates to vector geometry which is a grade 9 topic.
- Vector Geometry will be new and will require students to recall operations with fraction and ratios. A grade 9 topic left until the penultimate topic to allow students to recall more easily.
- Yet again we use this geometric topic to break up two algebraic topics and give students a different diet towards the end of the course.



### Unit 19 – Proportion and Graphs

- Direct and Inverse Proportion - Formula follows on from work on direct and inverse proportion without the formula in Y9
- Velocity – Time Graphs (Grade 9) is covered at the end mainly because of its difficulty but also because of the amount of interleaving required, gradients and area of trapeziums amongst other things.
- Transforming Functions stand alone as a discrete topic and are grade 9. Thus we cover them here at the end of the course.
- We also leave these algebraic topics to the end of the course as they are expected knowledge for any students doing A level and a big part of Core 1. Covering them here lessens the time between them being seen at the end of GCSE and the start of A level.