

Ian Ramsey CE Academy: Mathematics Curriculum Progression Model

CURRICULUM OVERVIEW	Curriculum What we study. Why study it. Why study it now.					How we teach the curriculum	What we expect from the curriculum
	<p><i>What we need pupils to have learnt at each point/end of each year and the logical connection and the sequential learning between what is studied in the different terms and between years. This is what is to be covered and when, effectively creating the idea that the <u>intent is the curriculum</u>. The intent is everything up to the point of teaching. The purpose of our curriculum and the knowledge we want our pupils to go away with in their working memory.</i></p> <p>The maths department aim to promote a fascination and enjoyment of mathematics for all pupils, whatever their level of ability. This will be developed at the same time as developing each pupil's ability to communicate using mathematics, with a strong emphasis on the use of correct mathematical language, notation and graphical representations or diagrams. We also wish to equip pupils with a series of tools to solve problems in everyday life and to raise an awareness of the use of Mathematics both across the curriculum and in everyday life.</p>					How we teach the curriculum	What we expect from the curriculum
	Setting	Designing	Planning	Delivering			
YEAR 7	What: Number Skills What: Pupils will arrive from primary school with the basic skills of addition, subtraction, multiplication, and division. However, with there being several methods, particularly for multiplication, it is useful to ensure that our pupils are all familiar with a consistent method. Why now: The four operations underpin all the future content of the curriculum.	What: Multiples, Factors, and Prime Numbers What: Pupils will be familiar with multiples and factors from the KS2 curriculum, but this is extended into HCF and LCM. Prime numbers will also have been covered at KS2, but these are investigated further and used when completing the Prime Decomposition of simple integers. Why now: This gives the pupils an early chance to see the fascinating side of maths – how can numbers that large be prime? Why is there no biggest prime number?	What: Basic Algebra What: Aspects of algebra are required for many later topics, not just in maths but across the school's curriculum. Pupils will begin by looking at algebraic notation and then move on to writing expressions and formula (which they need to also do in IT) then move on to setting up and solving linear equations. Why now: Basic Algebra is introduced early in Year 7 so it can be interleaved in all future topics and is required in other subjects, most notably Science.	What: Linear Equations What: Being able to solve linear equations is an important tool for problem solving. This also encourages pupils to work through problems in a step-by-step, logical way. This combines work from multiples and factors and the basic algebra units. Why now: Pupils complete this now, so that linear equations can be created and solved throughout the curriculum.	What: 2D and 3D shapes What: Pupils begin to raise spatial awareness by fostering an appreciation of the nature of space and exploring properties of shape and space through drawing and through practical activities. Pupils continue to develop their precise mathematical language and begin accurately drawing shapes, through views and nets. Why now: Pupils need to learn new notation and terminology so that they can communicate using the correct mathematical terms and language.	How we teach the curriculum <p><i>How we make learning memorable and how we support our pupils to remember it. How we use rote, retrieval, interleaving, metacognition etc. in our teaching; why we teach in the way we are and justify decisions around how and why it's being taught this way.</i></p> <p>In maths, we ensure that pupils are supplied with carefully chosen Example-Problems, which allows students to practice skills with similar questions immediately after they are modelled. Pupils are provided with the chance to practice their skills using intelligent practice. Rather than pupils repeating a mechanical activity, they are taken down a path where they are given an opportunity to deepen their conceptual understanding and establish links with other previously covered content.</p> <p>Activities to develop pupil's problem solving and reasoning skills are completed throughout the course, and pupils use Goal-Free problems and SSDD activities to enable them to select skills which they can apply to a given problem.</p> <p>Fortnightly lessons are used as 'Recap' lessons where pupils retrieve and apply previously taught skills to embed them in long-term memory.</p>	What we expect from the curriculum <p><i>How we make it challenging and ambitious for our pupils. How we assess learning, knowledge and understanding; what have they learnt and how well have they learnt it? Consider what assessments we use, when we use them and how and why we assess this way?</i></p> <p>Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there.</p> <p>Formative Assessment This is used to provide information about what pupils know, understand, and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include:</p> <ul style="list-style-type: none"> • Questioning • Effective teacher feedback (written and verbal) • Peer feedback • Pupil self-assessment <p>Summative Assessment This is also used at key points in each year to evaluation pupils' achievement. They allow a holistic view of pupils' progress and support the identification of areas requiring additional focus to improve learning overall.</p>
	What: Statistical Measures What: Pupils will look at finding averages and the range of data so they can begin interpreting, analysing, and comparing multiple distributions. Pupils will also discuss the effects that outliers will have on a set of data, which again will be used in other subjects across the curriculum. Why now: Pupils will continue to develop their reasoning abilities and decision making and these skills will be used in both Science and Geography to compare data.	What: Fractions, Decimals and Percentages What: Pupils continue to build upon the work from both KS2 and Year 7, to develop their skills which have a wide range of use in other subjects and everyday life. Pupils also need to understand the connections between fractions, decimals, and percentages. Why now: Pupils will work on probability which deals with values ranging from zero to one which should all be written as a fraction, decimal or a percentage.	What: Probability What: Pupils are introduced to probability and learn about chance, beginning with one event occurring then two events happening simultaneously. This allows pupils to investigate, reason and make conclusions about which games or events are fair. Why now: Pupils will be able to use the skills from the prior fractions, decimals and percentages unit and apply it in an everyday scenario.	What: Expanding and Factorising What: Pupils continue to look at more complex uses of algebra, which builds on their previous knowledge. It also allows pupils to further develop their skills when they return to solving linear equations, or in later years when they look at quadratic equations and factorising. Why now: This allows pupils to recap skills from both the multiples and factors and basic algebra units in Year 7.	What: Area and Perimeter What: Pupils will have covered Area and Perimeter in KS2 and Year 7 with basic shapes. Pupils will now look at finding the areas and perimeters of more complex shapes, but also find and spot the connections between the shapes and their formulae. Why now: Pupils will look at the area and perimeter of shapes, in preparation for finding the area, perimeter and volume of complex shapes during Year 9 / KS4 course.		
	What: Angles What: Pupils begin to classify and apply angle properties in given situations. This often combines solving equations with geometry and gives pupils further time to develop their geometric reasoning and develop their problem-solving skills and the use of proper mathematical language. Why now: This allows pupils to retrieve and combine work from past units, particularly solving equations and 2D and 3D shapes	What: Circles What: Circles may not seem that interesting at first glance but there are many interesting properties which gets pupils thinking. "How many sides does a circle have?" can allow pupils to develop their reasoning skills whilst learning and applying the correct mathematical key terms. Why now: Pupils also develop their mathematical language associated with circles which is required when later looking at Circle Theorems.	What: Linear Sequences What: Pupils get to spot patterns in number and picture sequences and describe them algebraically using skills they have developed in previous algebra units. Pupils continue to see the benefit of using algebra for problem solving, such as 'What is the 100 th term in this sequence?' Why now: Pupils will continue to develop links across mathematical topics and will further develop these when looking at linear graphs or quadratic sequences.	What: Co-ordinates and Graphs What: Pupils will have looked at coordinates in KS2 and Years 7 and 8 and the next step is to look at linear graphs. This combines work writing expressions, coordinates, and linear sequences. It will be revisited later for quadratic graphs or graphical inequalities. Why now: Pupils need these skills to find connections between variables, which is used in Science to find the equation connecting two variables.	What: Ratio and Proportion What: This topic has lots of real-life use, whether it is adjusting a recipe for the correct amount of people, finding out how many Euros your £100 will get or finding out how long 3 men will need to paint a fence, if 2 men take 5 days! Why now: Pupils will have looked at many instances of direct proportion without knowing it but will look at inverse proportion before writing these algebraically.		
YEAR 8	YEAR 9						

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Year 10 and Year 11	What: Standard Form (F/H) What: Standard Form (or Scientific Notation) is used to write extremely large or small numbers in a more concise manner. Pupils get to see real-life use by investigating themes such as “How big is an atom?” or “How much does the earth weigh?” – both which would result in numbers which would require a lot of digits if it wasn’t for standard form. This also requires pupils to retrieve prior knowledge from Indices units covered in KS3. It also allows pupils to be fascinated about the size of the real-life values and develops their mathematical language and notation skills.	What: Pythagoras’ Theorem (F/H) What: Pythagoras Theorem is perhaps one of the most well-known mathematical theorems, due to being discovered potentially as far back as 1900BC by the Babylonians, yet still having an incredible amount of real-life use today. Pythagoras is used in construction, architecture, engineering, navigation as well as more simple uses, such as finding out the diagonal length of a rectangle. Pythagoras’ Theorem is a key link which connects algebra and geometry together	What: Congruence and Similarity (F/H) What: Pupils build on the work from KS3 but now look at more formal rules which determine whether triangles are congruent. This allows pupils to further develop their reasoning skills, whilst still emphasising correct mathematical terminology and accurate diagrams. This also has links to other parts of the maths curriculum, such as ratio and proportion, perimeter, area and volume, and the basic shape work from KS3.	What: Transformations (F/H) What: Pupils learn about the four transformations on a set of axes. It allows students to further develop their reasoning skills when thinking about whether transformations change or preserve the lengths of sides or the orientation of the given shapes. It also allows pupils to develop their spatial awareness and explore reflections and rotational symmetry in art, such as in Rangoli patterns or the work of M.C. Escher, whose work contains examples of rotational and reflection symmetry.	What: Trigonometry (F/H) What: Trigonometry is used in many occupations including surveying, engineering, medicine, and astronomy. Trigonometry is one of the most applicable subjects in maths. It also is another link between algebra and geometry and has cross-curricular uses in Physics and Engineering, whilst drawing on prior knowledge of solving equations, 2D shapes and angles. It is also commonly used in various guises in problem solving and reasoning in geometry questions, including those with 3D applications.	<p>In maths, we ensure that pupils are supplied with carefully chosen Example-Problems, which allows students to practice skills with similar questions immediately after they are modelled. Pupils are provided with the chance to practice their skills using intelligent practice. Rather than pupils repeating a mechanical activity, they are taken down a path where they are given an opportunity to deepen their conceptual understanding and establish links with other previously covered content.</p> <p>Activities to develop pupil’s problem solving and reasoning skills are completed throughout the course, and pupils use Goal-Free problems and SSDD activities to enable them to select skills which they can apply to a given problem.</p> <p>Fortnightly lessons are used as ‘Recap’ lessons where pupils retrieve and apply previously taught skills to embed them in long-term memory.</p>	<p>Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there.</p> <p>Formative Assessment This is used to provide information about what pupils know, understand, and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include:</p> <ul style="list-style-type: none"> • Questioning • Effective teacher feedback (written and verbal) • Peer feedback • Pupil self-assessment <p>Summative Assessment This is also used at key points in each year to evaluation pupils’ achievement. They allow a holistic view of pupils’ progress and support the identification of areas requiring additional focus to improve learning overall.</p>		
	Why now: Standard Form has several cross-curricular uses and requires applications of KS3 topics such as Index Laws.	Why now: Pupils are introduced to more formal proofs and Pythagoras Theorem has lots of proofs which can be shown through diagrams or algebraically.	Why now: Pupils will prepare to use the skills and knowledge learnt from this topic and apply it when looking at Area and Volume Scale Factors, or volume of more complex shapes like frustums.	Why now: Transformations are used in several other subjects, such as Art (particularly rotations and reflections) and will extend this if they study graphical transformations.	Why now: Pupils need these skills across the school curriculum and in many jobs and gives them the foundations required for these and for those wishing to take Maths beyond GCSE where this is a key topic.				
	What: Simultaneous Equations (F/H) What: Simultaneous equations are taught as an extension to the previous content covered at KS3. Rather than solving an equation with a single variable, they now have pairs of equations with two variables to solve. This requires and recaps the previous work, whilst ensuring pupils continue to develop their mathematical communications skills as opposed to using ‘trial and error’ methods.	What: Surds and Indices (Higher) What: Surds introduce irrational numbers, which leads onto other fascinating properties: How can two irrational numbers multiply to make a rational number? Can we make a reasoned and logical case why the square of 2 cannot be written as a fraction with rational values? Surds and Indices lend themselves to providing opportunities for pupils to write values in different forms, which allows them to see the links between the topics.	What: Cumulative Frequency (Higher) What: Cumulative Frequency and Box Plots allow for a more detailed analysis and comparison of multiple sets of data using graphical methods. Knowledge and skills from KS3 extended upon, and pupils are introduced to quartiles, which allows them to create more accurate analysis of the data. The topic also provides opportunities to discuss outliers and how these affect the mean and range (but not the median and IQR)	What: Non-right-angled Trigonometry (Higher) What: Pupils are introduced to trigonometry of non-right-angled triangles, which comes from the work they have previously covered on right-angled triangles. Demonstrations will be shown to the pupils which show where the Sine and Cosine Rules originate, and pupils will need to develop an understanding of when to use which rules and skills, which in itself, is a useful skill when problem solving.	What: Pre-Calculus (Higher) What: Pupils will have looked at Distance, Speed and Time in KS3 and in science, where these variables are constant, but in everyday life this is often not the case. Pupils will look at ways of estimating speeds, distances and times using distance – time and speed – time graphs using the trapezium rule or the gradient of a tangent – both which pupils will have covered previously, but this unit allows these to be applied in a new real-life context.				
	Why now: Pupils get to use all their existing algebra skills, such as solving and rearranging equations, expanding, and factorising, and substitution. Pupils doing the Further Maths course need to solve sets of equations with 3 variables.	Why now: Pupils look deeper at some of their existing knowledge and use it to solve problems and make reasoned statements. It also allows for more content to be completed without a calculator, which makes other topics more accessible.	Why now: Pupils will have used the average and range to compare data sets in KS3, but the new content allows them to make more accurate comparisons, which are also used across the curriculum, especially in Geography.	Why now: Pupils will deepen their understanding of trigonometric ratios, in preparation for trig graphs and content at A Level, which involves a lot of content which uses these.	Why now: Pupils will establish more links between the different elements of mathematics in a context which prepares pupils for post-16 study of mathematical courses, where they will cover integration and differentiation.				