Maths curriculum overview

Curriculum intent:

At Reddish Vale High School, our intent is for the mathematics curriculum to be designed to ensure that learners receive a high-quality mathematics education that will: develop their ability to reason mathematically; help to develop an appreciation of the beauty and power of mathematics; and have a sense of the purpose, enjoyment and curiosity about the subject now and into adult life. Our aim is:

- To create a journey of mathematical knowledge and skills that builds on prior knowledge and builds a deeper understanding of topics in the mathematics curriculum.
- To raise, develop and sustain students' mathematical skills, intervening swiftly to help those having difficulty to make sure they keep up, and to stretch and deepen the learning of the 'rapid-graspers'
- To develop skills and knowledge, so learners have the mathematical ability required for future learning and employment.
- To use metacognitive skills to improve independence and resilience in learning
- To address the school focus of low numeracy levels in order for our students to be more numerate across the curriculum and to be ready for adult life.

At Reddish Vale High School, the mathematics curriculum follows the themes and principles of mathematics mastery, where all students are encouraged by the belief that by working hard at mathematics they will succeed and that making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.

The mathematics curriculum allows students to develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. This is achieved through developing procedural fluency and conceptual understanding in tandem, since each supports the other.

Lessons are designed to have a high-level of teacher-student and student-student interaction where all students in the class are thinking about, working on and discussing the same mathematical content. Challenge and the opportunity to deepen understanding of the key mathematical ideas is provided for all and every attempt is made to keep the whole class learning together through the use of support and challenge to allow every student to fully grasp the concepts and ideas being studied. This ensures that all students gain sufficiently deep and

secure understanding of the mathematics to form the foundation of future learning before moving to the next part of the curriculum sequence.

Students who grasp concepts rapidly will be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material will consolidate their understanding, including through additional practice, before moving on.

At Reddish Vale High School, you will see:

- Knowledge and skills are built through a sequential mathematics mastery curriculum over five years.
- New concepts are taught through a mix of concrete, pictorial and abstract examples
- Metacognition strategies are used throughout the curriculum through interleaving of the maths mastery and the skills across each topic area. It is also addressed through retrieval practice 'Do Now' starters and 'MAD' time lessons allocated every 2/3 weeks to ensure learners can fluently recall facts.
- There is less teaching and more learning in lessons – whole class interactive teaching, a slower pace in lessons with a clear focus for learning (one small step at a time), with more time spent on one idea
- Lessons have a clear structure with learners being given the opportunity to use their mathematical knowledge skills and language to recap prior learning. Teachers then develop new learning through discussions, demonstration and practical activities as appropriate. Learners apply their skills independently. The plenary provides opportunities for learners to verbalise their new learning and demonstrate they have understood
- Learners are not left behind or insufficiently challenged - all learners are enabled to keep up during lessons and intervention given where appropriate ensures no-one falls behind. Those who are able to are encouraged to go deeper (lesson structure enables learners needing support or additional challenge to be identified and supported in the lesson and misconceptions can be rapidly addressed)
- Real life applications are given wherever possible to make learning relevant and not always abstract; mathematics is taught with a purpose.

	Autumn Term		Spring Term		Summer term	
Year 7	**Understanding magnitude** Understanding place value Comparing the magnitude of positive real numbers Multiplication and division by powers of ten Rounding numbers Approximating calculations using rounding Understanding the limits of accuracy **Understanding abstraction** An introduction to the language and conventions of algebra Simplifying expressions by collecting like terms	**Understanding abstraction** Substituting into algebraic formulae Solving, forming and rearranging one-step equations Using standard scientific formulae **Understanding magnitude** Understanding negative numbers Understanding and using directed numbers	**The four operations and the properties of number** Properties of number (multiples, factors, primes, squares) Using the rules of BIDMAS Addition and subtraction of integer and decimal numbers and the links between addition, subtraction and the properties of number Using formal and informal methods for addition and subtraction Multiplication, and its links to addition and the properties of number Formal and informal methods of calculation for multiplication	**The four operations and the properties of number** Division and subtraction of integer and decimal numbers and the links between division, subtraction and the properties of number Formal and informal methods of calculation for division Division and multiplication of integer and decimal numbers and the links between division, multiplication and the properties of number	**Understanding proportion - Fractions** Understanding the nature of proportion Understanding fractions as parts of an amount, as division and as locations on a number line Understanding fractional equivalence Comparing the magnitude of fractions Finding a fraction of an amount	**Understanding proportion - Fractions** Understanding addition and subtraction of fractions and mixed numbers Recognising and understanding reciprocals Understanding multiplication and division of proper fractions, improper fractions and mixed numbers

	Autumn Term		Spring Term		Summer term	
Year 8	**Understanding proportion – Ratio** Recap the definition of proportion Recap the concept of fractions as equality of parts An introduction to ratio through its relationship to fractions. Understanding equivalence of ratios Understand and use ratio in a variety of circumstances including sharing and problem solving. Understand the link between ratio and linear functions.	**Understanding proportion – Percentage** Recap the definition of proportion An introduction percentage through its relationship with fraction Understanding the relationship between percentage, fraction and ratio Finding percentages of amounts Solving problems involving percentages, including percentage change and original value problems Understanding how to convert between fractions, decimals and percentages	**Further uses of algebra** Simplify expressions involving the use of index laws Multiplying single terms over a bracket Expanding the product of two (or more) binomials Factorising quadratic expressions Solving equations with unknowns on both sides (including where brackets are involved)	**Further uses of algebra** Solving simultaneous equations Solving quadratic equations Solving inequalities Understand the definition of, and be able to recognise, types of sequences Using the nth term of sequences, finding the nth term of sequences, and problem solving with sequences	**Graphing** Drawing axes Plotting co-ordinates in all quadrants Solving geometric problems involving coordinates Interpreting real life graphs Understanding functions as input and output Drawing linear graphs Understanding gradient	**Graphing** Identifying parallel lines and perpendicular lines from their graphs and their equations. Plotting and understanding quadratic graphs Using quadratic graphs to solve equations Plotting cubic, exponential and reciprocal graphs

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Year 9	**Understanding data** Understanding key terms related to data and data handling. Understanding and using measures of spread and central tendency and their utility, and using these to compare samples or populations. Understanding grouped data, and using measures of central tendency and spread to compare populations.	**Understanding data** Constructing and interpreting pie charts, bar charts and histograms. Constructing and interpreting scatter graphs. Understanding the dangers of extrapolation. Understanding the difference between correlation and causation. Understanding the ways in which data can be used to inform and to manipulate. Avoiding the dangers of being manipulated by statistics. **Understanding probability** Understanding the nature of prediction Understanding the nature of likelihood. Knowing how to put probabilities on a scale	**Understanding probability** Utilising fractions, decimals and percentages as measures of likelihood. Using sampling in order to make predictions. Understanding, constructing and using sample space diagrams Understanding, constructing and using Venn diagrams Understanding, constructing and using two-way tables (and their links to Venn diagrams.) Understanding, constructing and using tree diagrams.	**Understanding standard form** Understanding how to write numbers in and out of standard form, and performing calculations in standard form **Geometry 1** Standard units and unit conversions. The concept of parallel and perpendicular lines. Understanding angles, and measuring angles. Angles in polygons, including the categorisation of shapes using angle properties. Understanding and using bearings.	**Geometry 2** Understanding the nature of the 1st, 2nd and 3rd dimensions. Understanding and calculating 1d and 2d measures - perimeter, circumference, area Drawing and interpreting plans and elevations of 3d shapes Understanding and calculating in 3d – surface area and volume	**Geometry 3** Understanding and using standard procedures in right angle triangles. Understanding and using scale factor Drawing, and solving problems with, standard constructions (including loci.)

	Autumn Term		Spring Term		Summer term	
Year 10 Foundation Tier	**Number** Ordering and place value. Rounding and estimating. 4 operations including negative numbers. Calculations and problem solving with fractions and decimals. Order and inverse operations. Factors, multiples and primes, including HCF, LCM and prime factorisation. <u>**Algebra – types, simplify and graphs**</u> Identify different types of algebra. Collect like terms. Expand and factorise brackets. Index laws Substitution. Plot straight line graphs. Understand gradients and intercepts including parallel and perpendicular lines.	**Number** Powers and roots. Standard form. <u>**Ratio and proportion - Percentages**</u> Percentage of amount. Percentage change. Reverse percentages. Financial problems. Compare fractions, decimals and percentages. Interpret growth and decay. <u>**Algebra - Sequences**</u> nth term. Special sequences. Recognise quadratic and geometric sequences. <u>**Statistics**</u> Types of data, collecting data and sampling. <u>**Draw and analysis tables, charts and graphs**</u> Two way tables. Pictograms. Line graphs. Bar charts, including comparative and composite. Pie charts. Time series. Scatter graphs.	**Ratio and Proportion** Use and convert metric measures. Scale factors and maps. Including length, area and volume. Compound measures. Simplify and divide by a ratio. Ratio to fractions and linear functions. Proportion problem solving eg; conversion, scaling, mixing etc <u>**Algebra – expressions, graphs, solving and inequalities**</u> Change the subject. Mapping Recognise, sketch and interpret linear, quadratic, cubic, reciprocal and real life graphs. Solve linear equations and inequalities. Represent an inequality on a number line.	**Statistics** Find and compare averages including from a table. <u>**Theoretical probability**</u> Use correct probability terms. Use the probability scale 0-1. Understand mutually exclusive events equal 1. <u>**Experimental probability**</u> Record frequency of outcomes. Analysis probability of experiments using tables and frequency trees. Calculate expected outcomes. <u>**Sets and diagrams**</u> Use tables, grids and Venn diagrams to organise data. Sample space diagrams. Use tree diagrams, two way tables and Venn diagrams from independent and dependent events as well as conditional probabilities.	**Geometry** <u>**Shape properties**</u> Geometrical terms. Draw and describe 2d shapes, using the correct property descriptions and notation. As well as parts of a circle. Transformations. Co-ordinates problem solving. Properties of 3d shapes including nets. Plans and elevations. <u>**Angles**</u> Sum at a point, straight line, triangle and quadrilateral. Angles in parallel lines. Interior and exterior angles in a regular polygon. Sum of interior angles. Bearings	**Geometry** Transformations. Perimeter and area of 2d shapes including a circle and parts of a circle. Surface area of a cube & cuboid.

	Autumn Term		Spring Term		Summer term	
Year 10 Higher Tier	**Number** Ordering and 4 operations of fractions. Rounding and estimating. Bounds and error intervals. Product rule for counting. 4 operations including negative numbers. Calculations and problem solving with fractions and decimals. Converting recurring decimals. Order and inverse operations. Factors, multiples and primes, including HCF, LCM and prime factorisation. <u>**Algebra – types, simplify and graphs**</u> Identify different types of algebra. Collect like terms. Expand and factorise brackets. Index laws Substitution. Plot straight line graphs. Understand gradients and intercepts including parallel and perpendicular lines.	**Number** Powers and roots. Fractional indices. Standard form. <u>**Ratio and proportion - Percentages**</u> Percentage of amount. Percentage change. Reverse percentages. Financial problems. Compare fractions, decimals and percentages. Interpret growth and decay. <u>**Statistics**</u> Types of data, collecting data and sampling. <u>**Draw and analysis tables, charts and graphs**</u> Two way tables. Pictograms. Line graphs. Bar charts, including comparative and composite. Pie charts. Time series. Scatter graphs. Histograms.	**Ratio and Proportion** Use and convert metric measures. Scale factors and maps. Including length, area and volume. Compound measures. Simplify and divide by a ratio. Ratio to fractions and linear functions. Proportion problem solving e.g.; conversion, scaling, mixing etc. Direct and inverse proportion. <u>**Algebra – expressions, graphs, solving and inequalities**</u> Change the subject. Construct and solve linear equations and inequalities. Represent an inequality on a number line. Solve inequalities with 2 variables including set notation and on a graph. Calculate with Surds.	**Number** Simplify surds and rationalise the denominator. <u>**Statistics**</u> Calculate and compare averages including from a table. Quartiles and interquartile range. Box plots and cumulative frequency. <u>**Theoretical probability**</u> Use correct probability terms. Use the probability scale 0-1. Understand mutually exclusive events equal 1. <u>**Experimental probability**</u> Record frequency of outcomes. Analysis probability of experiments using tables and frequency trees. Calculate expected outcomes. <u>**Sets and diagrams**</u> Use tables, grids and Venn diagrams to organise data. Sample space diagrams. Use tree diagrams, two way tables and Venn diagrams from independent and dependent events as well as conditional probabilities. <u>**Geometry – circles**</u> Understand parts of a circle. Use and Proof Circle theorems.	**Algebra - Expressions** Expand and factorise binomials, including the difference of two squares. Construct algebraic proofs. Inverse and composite functions. <u>**Graphs**</u> Recognise, sketch and interpret linear, quadratic, cubic, reciprocal, and exponential graphs. Equation of a circle and tangent to a circle. <u>**Solving**</u> Solve quadratics. Iterative process. <u>**inequalities**</u> Solve inequalities. Represent an inequality on a number line, using set notation and on a graph. <u>**Geometry – transformations and Vectors**</u> Draw and describe single and connected transformations including negative and fractional enlargements. Calculate vectors and use a Scaler vectors. Including proofs.	**Algebra – Solving** Solve simultaneous equations algebraically and graphically, including quadratics. <u>**Geometry**</u> Pythagoras. Trigonometry of right angled triangles. 2D and 3D Know the exact values of sin, cos and tan. Sine rule. Cosine rule. ½ absinc. Bearings.

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Year 11 Foundation Tier	**Expressions** Expand and factorise binomials, including the difference of two squares. **Geometry** Congruency proof Volume of a cuboid Volume and surface area of a cylinder, prism, pyramid and sphere. Area of composite shapes, including circles and problem solving.	Pythagoras. Trigonometry in right angle triangles. Revision for November mock	Topics covered based on RAG analysis of the first mock.	Topics covered based on RAG analysis of the first mock.	Topics covered based on RAG analysis of the second mock.	GCSE Paper 1 non-calculator Paper 2 and Paper 3

	Autumn Term		Spring Term		Summer term	
Year 11 Higher Tier	**Algebra and proportion** Change the subject Converting recurring decimals. Direct and inverse proportion. **Number** Calculate with Surds. Simplify surds and rationalise the denominator. **Statistics** Quartiles and interquartile range. Box plots and cumulative frequency. Histograms. **Graphs** Recognise, sketch and interpret linear, quadratic, cubic, reciprocal, and exponential graphs. Equation of a circle and tangent to a circle.	**Geometry** Sine rule. Cosine rule. ½ absinc. Revision for November mock	Topics covered based on RAG analysis of the first mock.	Topics covered based on RAG analysis of the first mock.	Topics covered based on RAG analysis of the second mock.	GCSE Paper 1 non-calculator Paper 2 and Paper 3 calculator allowed.

Extra curricular:
UKMT Maths Challenge
Numeracy week (World Numeracy Day)
Maths puzzle club
Chess club
University Problem solving days
University Maths Enrichment

Functional Skills:	
Literacy	Numeracy
KS3 – Keywords, understanding of key terms and explaining mathematical processes are embedded into the curriculum at KS3. Real life links and applications are embedded into learning and there is a focus on using precise descriptive mathematical language when explaining solutions and method. **KS4** – Building on from Ks3, keywords, understanding of key terms and explaining mathematical processes are continued to be developed. Skills in applying different areas of Mathematics to AO2 and AO3 questions through breaking down a problem into its relative parts is tested frequently both in class and through `application` sections of homework tasks.	

Contribution to students social, moral, spiritual, cultural, personal development & wellbeing

Social	Moral	Spiritual	Cultural	Personal development & wellbeing
A safe forum for discussion is encouraged within lessons. Conflicting answers are encouraged in order to promote discussion. A variety of questioning and assessment techniques are used to facilitate positive interaction and dialogue	All the rules of the school and society at large are adhered to in a firm fair manner promoting equality throughout tasks, roles and discussions. Conceptual misconceptions and misnomers are referenced throughout delivery, with particular reference to proportional reasoning and statistical analysis	The Mastery philosophy in RVHS encourages Mathematical thinking and curiosity. An enhanced focus is given to the journey through critical thinking and analysis, with less emphasis on the answers and far more on the construct and development.	Cultural links are encouraged within the curriculum delivery to broaden and contextualize topic areas. Reference is given to the origins of methods and their relevance and application in the modern world. Key Mathematics dates are celebrated, such as pi day	Pupils` meta-cognitive strategies and skills are developed through constant reflection and assessment within the delivery of the curriculum. Pupils are regularly encouraged to reflect on their own learning through knowledge organisers and address areas of weakness through self and teacher identification.

Careers / Gatsby benchmark links

Links to careers / jobs	Careers talk (possible contacts)	Career & labour market information	Workplace visit	Encounters with further / higher education
A higher level qualification in mathematics is a springboard to a wide range of rewarding careers. Whether the focus is theoretical mathematics or applied, the analytical and quantitative skills you develop are valuable assets that many employers need. Some types of organisations that hire Maths graduate are: • Government agencies and academic research institutes • Engineering firms • Biomedical and health services companies • Insurance agencies • Real estate firms • Medical device manufacturers • Airlines and other transportation service providers • Financial institutions	Reddish Vale High School endeavors to invite prominent and successful past pupils and local businessmen to address and inspire current pupils.	Math skills are important in many careers, most notably the science, technology, and engineering professions. But such skills also feature prominently in some careers that may not seem like a natural endpoint for someone with a math degree. Video game developer and computer animator are just two examples of less-obvious jobs that use calculus, for instance.	Throughout the year the Mathematics department will arrange visits in the local community and beyond to workplaces where Mathematics is a pre-requisite to raise and realise aspirational careers.	The Mathematics department arranges visits to local universities in line with the Able and Talented provision. Students are encouraged to pursue higher level studies and offered support from the department post 16.