

Mathematics Unit Overview Year 9

The Year 9 curriculum, as for all years, is a spiral curriculum which enables us to recap and build on topics covered in KS2 and Years 7 and 8. Ever mindful of the potential gaps or misconceptions caused by lost face-to-face learning, each topic recaps key skills that may not have been mastered.

Students in year 9 are in sets based on prior attainment, flightpaths, results from their Year 8 assessments, and Year 8 teacher input. Sets 1-3 follow the main curriculum, with sets 4 and 5 missing some of the higher-grade skills; this is with a view to Higher vs. Foundation trajectories. Sets are reviewed after every half term assessment to enable every student to succeed.

Key knowledge on which we will recap and build during Year 8 includes:

- Place value
- Prime numbers, factors, highest common factors and lowest common multiples
- Rounding decimals
- The four operations of decimals, fractions and negative numbers
- The order of arithmetic operations (BIDMAS)
- Pictograms, bar charts, bar-line graphs, Line graphs, pie charts, scatter diagrams
- Averages from lists of data and frequency tables
- Simplify algebraic expressions
- Substitute into formulae and change their subject
- Ratio and proportion
- Use of percentages
- Linear, quadratic and special sequences, such as Fibonacci
- Angle facts
- Accurate drawings and bearings
- Transformations
- Area and perimeter
- Volume and surface area
- Equations of straight lines
- Probability

Mathematics - Year 9 Unit 1

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
Number	<p>Knowledge: Know the correct order of operations (BIDMAS) for powers, negatives, decimals and fractions. Awareness of the use of number lines, place value, inequalities to compare positive and negative numbers. Significant figures. Prime numbers, factors and multiples. LCM and HCF and related facts. Four rules of negative numbers. Squares and square roots.</p> <p>Understanding: Use inequality statements Solve expressions with more than 1 operation. Apply BIDMAS when working with powers, negatives, decimals and fractions. Solve multi step number problems in a real-life context. Apply HCF and LCM to real life problems. Round to any number of significant figures. Using significant figures in a real-life context. Recognise that squares and square roots are inverse operations.</p> <p>Skills: Read and write inequalities to compare numbers. Apply the four rules to negative</p>	<p>Students can: Apply BIDMAS to correctly identify which operation to do first. Correctly write an inequality sign between 2 and 3 numbers to show which are larger. Identify and rectify an error in a calculation. Explaining what would happen if one element of a question was altered in particular linking to BIDMAS. Use the four rules of negative numbers in real-life and problem-solving contexts. Consistently find the HCF and LCM accurately including where there are 3 numbers Interpret worded questions and accurately determine that LCM or HCF are required. Utilise approximations and explain whether their answer is an over- or under-estimate.</p>	<p>Y7 Unit 1: Primes, squares, cubes, roots</p> <p>Y7 Unit 2: Comparing Numbers, Ordering multiples, factors, HCF and LCM from lists</p> <p>Y7 Unit 3: Multiply and divide decimals and whole numbers, addition/ subtraction of negatives, four rules, BIDMAS with four rules</p> <p>Y7 Unit 4: Round to decimal places and 1 significant figure, estimating simple calculations</p> <p>Y8 Unit 1: Prime factors, HCF and LCM from Venn diagram</p> <p>Y8 Unit 2: Four rules for negatives, BIDMAS for powers Integers, Comparing Decimals</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

<p>numbers. Identify which operation to use first in a problem. Ordering numbers with different place values. Written methods to solve questions involving different operations. Methods for estimating calculations. Application of their knowledge of primes, squares, factors, multiples, negatives, rounding, four rules.</p>			
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Mathematics – Year 9 Unit 2

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
Fractions	<p>Knowledge: Consolidation of methods for four rules for fractions. Know how to express one quantity as a fraction of another. Use a calculator with fractions.</p> <p>Understanding: Solve multistep problems involving fractions in a real-life context. Solve problems involving fractions in different contexts. Understand the interrelationship between decimals and fractions.</p> <p>Skills: Four rules for any type of fraction. Convert between mixed numbers and improper fractions, including with a calculator. Confidence with calculations involving fractions both with and without a calculator.</p>	<p>Students can: Calculate accurately with any form of fraction. Justify calculation methods for fractions using diagrams. Apply the four rules of fractions in real-life and problem-solving contexts.</p>	<p>Y7 Unit 13: Addition and subtraction of fractions, mixed and improper Multiplication and division of fractions, mixed and improper</p> <p>Y8 Unit 2: Four rules of fractions on a calculator.</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

Mathematics - Year 9 Unit 3

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Data</p>	<p>Knowledge: How to use tally charts and frequency tables to display and collect data. How to draw and interpret pictograms, bar charts, stem and leaf diagrams, composite bar charts, bar-line graphs, pie charts and scatter diagrams. How to draw a line graph to show a trend in data. How to calculate the mean, mode and median of data from a list, stem and leaf diagram or frequency table and estimate the mean of continuous data from a grouped frequency table. How to work out the range of data. How to draw and use a line of best fit on a scatter graph.</p> <p>Understanding: Use the correct method for a given average or the range. Interpret data presented in a problem. Identify patterns and trends in data. Evaluate which average is most appropriate in a scenario. Interpret a range of graphs in a variety of contexts. Appreciate the difference between lines of best fit in a Science and Mathematics context.</p> <p>Skills:</p>	<p>Students can: Accurately collect data for an investigation or experiment in a tally chart. Choose, construct and evaluate the most appropriate chart to display a set of given data. Choose, accurately work out and evaluate the most appropriate average for a given set of data. Calculate averages and measures of spread from a frequency table given discrete or continuous data. Interpret the trends within data or from a chart/graph, describing what the results of an investigation mean. Interpret and explain data given in a pie chart/bar chart/line graph. Compare data sets given in table form or in graphs/charts. Recognise the limitations of what data can tell us. Distinguish between correlation and causation. Apply previous knowledge such as fractions and proportion. Apply to real life applications and worded problems. Apply to other subject areas, such as science and</p>	<p>Y7 Unit 17: Frequency tables Construct comparative bar charts, draw and interpret pie charts</p> <p>Y7 Unit 18: Mode, median mean and range from data in a list, and a frequency table,</p> <p>Y8 Unit 15: Plot and interpret a scatter graph and understand correlation</p> <p>Y8 Unit 16: Modal and median class from grouped data, estimate of the mean from a frequency table.</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

	<p>Graph-drawing including the appropriate choice of scale for axes. Analysing and evaluating data. Displaying data. Using a calculator. Interpreting the different types of graphs. Mean, median, mode and range from a variety of sources. How to calculate angles on a pie chart.</p>	<p>geography.</p>		
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Mathematics - Year 9 Unit 4

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
Algebra	<p>Knowledge: Know that you can express a rule in words and algebraically. Use the standard algebraic conventions. Identify expressions, equations, formulae and identities. Identify linear equations.</p> <p>Understanding: Use and interpret algebraic notation. Know what it means to simplify an expression. Collect like terms involving terms with combinations of variables. Appreciate what it means to solve linear equations. To be able to check a formula with a known result.</p> <p>Skills: Simplify expressions by collecting like terms. Substitute into expressions and formulae. Expand brackets, including double brackets. Solve linear equations with variables on one or both sides. Factorise linear and quadratic expressions. Change the subject of formulae, including with brackets and powers.</p>	<p>Students can: Check formulae by using a known result. Explore problems where there are multiple answers and elements of experimentation, investigation and reasoning. Be able to check an algebraic simplification by substituting values. Check the solution of an equation by substitution. Apply previous knowledge such as in spotting patterns and relationships. Apply to real life applications and worded problems. Apply algebra to other subject areas such as science, music, and art.</p>	<p>Y8 Unit 5: Knowing how to factorise simple linear expressions.</p> <p>Y8 Unit 8: Knowing how to substitute values into an algebraic sequence. Describing a sequence with a position-to-term rule</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons Corbettmaths</p>

Mathematics - Year 9 Unit 5

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Ratio and Proportion</p>	<p>Knowledge: Know what a ratio is. Methods to solve direct proportion problems. Methods to compare values. The key triangles/formulae for pay, speed, density, force. How to calculate compound and repeated percentages.</p> <p>Understanding: Interpret information and select the correct method for solving. Calculate compound measures. Use appropriate units and convert where necessary.</p> <p>Skills: Simplify a ratio. Express a ratio as a fraction. Share in a given ratio. Calculate values from a ratio and partial information. Solve problems involving scaling or unitary costs. Find a relevant multiplier in a situation involving proportion. Solve compound measure problems.</p>	<p>Students can: Consistently and accurately calculate values within ratio problems. Relate tasks to real life situations especially personal finance. Select the most appropriate method to explain working. Use multi method approaches to problem solving in a ratio context. Link to previous knowledge of fractions. Link to other subject areas, such as science, technology.</p>	<p>Year 7 Unit 9: Simplify a ratio, share a quantity into a 2-part ratio.</p> <p>Year 7 Unit 11: Conversion between units.</p> <p>Year 8 Unit 5: Substitution into a formula.</p> <p>Year 8 Unit 7: Relate ratios to fractions.</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons Corbettmaths Personal finance support from Nationwide and other banks. Science department.</p>

Mathematics - Year 9 Unit 6

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Percentages</p>	<p>Knowledge: Percentages and how they relate to decimals, fractions and ratios. Use of a calculator for percentages. Know what interest means and how it is important in real-life. Recognise simple and compound interest.</p> <p>Understanding: Use the four rules appropriately with percentages. Express one quantity as a percentage of another. Find percentages of amounts. Calculate percentage changes. Increase or decrease an amount by a given percentage.</p> <p>Skills: Use a calculator efficiently to solve problems involving percentages. Use multipliers to increase or decrease a quantity. Solve problems involving reverse percentages. Solve problems involving simple and compound interest.</p>	<p>Students can: Understand the effect of repeated percentage changes. Solve percentage problems in a variety of contexts including financial, scientific and population. Use a calculator efficiently to explore the effect of a change to interest rates. Relate learning to other topics such as fractions and decimals. Relate learning to other subject areas, such as technology, geography and science.</p>	<p>Year 7 Unit 8: Exploring fractions Decimals and Percentages</p> <p>Year 8 Unit 10: Calculating fractions decimals and percentages</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

Mathematics - Year 9 Unit 7

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Fractions, decimals and percentages</p>	<p>Knowledge: The relationship between fractions, decimals and percentages. Methods for calculating with decimals, fractions and reciprocals, including non-calculator and calculator methods. Terminating and recurring decimals.</p> <p>Understanding: Convert between fraction, decimals and percentages. Four operations with decimals. Select the appropriate method of calculation for different problems.</p> <p>Skills: Use a formal method to add and subtract decimals. Use formal methods to multiply and divide decimals. Apply methods of checking for the correct magnitude of the resulting answers. Convert between fractions, decimals and percentages with and without a calculator. Write a fraction as either a terminating or recurring decimal.</p>	<p>Students can: Fluently convert between fractions, decimals and percentages. Apply the relationships between ratios and fractions, decimals and percentages. Routinely check the order of magnitude of the solutions to problems. Choose the most appropriate form for an answer, for example when a fraction is better than a decimal. Relate learning to other topics such as fractions and percentages. Relate learning to other subject areas, such as technology, geography and science.</p>	<p>Year 8 Unit 6: Exploring fractions, decimals and percentages</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

Mathematics - Year 9 Unit 8

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Probability</p>	<p>Knowledge: The vocabulary of probability: theoretical/experimental probability, event, trial, outcome, impossible, unlikely, evens chance, likely, certain, equally likely, mutually exclusive, exhaustive, independent, possibility space, sample space diagram, Venn diagram. Equally likely outcomes and how they can be used to calculate theoretical probabilities. The sum of the probabilities of all possible outcomes is 1 $P(\sim A) = 1 - P(A)$. If A and B are mutually exclusive, $P(A \text{ or } B) = P(A) + P(B)$. If A and B are independent, $P(A \text{ and } B) = P(A) \times P(B)$.</p> <p>Understanding: Compare and contrast probabilities determined by equally likely outcomes and experimentally. Recognise that it is important to conduct an experiment a large number of times to find a reliable experimental probability. Calculate the number of expected outcomes of an event.</p> <p>Skills: List all the possible outcomes of an experiment.</p>	<p>Students can: Explain why the outcomes of an experiment may not match the theoretical probabilities. Solve problems in which the probability is known but the number of trials or outcomes is not. Use Venn diagrams to calculate conditional probabilities. Apply previous knowledge such as fractions, decimals and percentages. Apply to real life applications and worded problems. Apply to other subject areas, such as science and PSHE.</p>	<p>Year 8 Unit 4 – Understanding risk 1</p> <p>Year 8 Unit 13 – Understanding risk 2</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

	<p>Use sample space diagrams to list the outcomes of two events. Use Venn diagrams to show frequencies in probability questions. Calculate experimental probabilities by using the relative frequency of the outcomes of an experiment.</p>			
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Mathematics - Year 9 Unit 9

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
Sequences	<p>Knowledge: Standard sequences such as odd/even, linear, geometric, square numbers, triangular numbers, quadratic sequences and Fibonacci-type sequences. What is meant by term-to-term and position-to-term rules. n^{th} term of a sequence.</p> <p>Understanding: Recognise patterns in sequences and growing patterns. Identify where sequences occur and are important in real-life situations.</p> <p>Skills: Continue sequences and growing patterns and describe the rules for these. Generate sequences from a given starting point and rule. Use a given n^{th} term of a sequence to write any term of the sequence. Use the n^{th} term of a sequence to determine whether a number is in the sequence. Find the n^{th} term of a linear sequence. Find the n^{th} term of a quadratic sequence. Identify special sequences, such as Fibonacci, and generate further terms.</p>	<p>Students can: Solve sequence problems in which there are missing terms by speculating about and testing possible rules. Understand the relationship between a growing pattern and the rule for the resulting sequence. Distinguish between term-to-term and position-to-term rules. Use the n^{th} term of a sequence to solve problems. Relate learning to other topics such as algebra. Relate learning to other subject areas, such as music, art and science.</p>	<p>Year 7 Unit 10: Spotting patterns in sequences and continuing them</p> <p>Year 8 Unit 8: Recognition of sequences and their term-to-term rule</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

Mathematics - Year 9 Unit 10

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Angles and constructions</p>	<p>Knowledge: The number of degrees on a straight line, at a point, in a triangle and in a quadrilateral. Special types of triangle and quadrilateral and their angle properties. Vertically opposite angles. Formulae linked to internal and external angles of regular polygons. The names of polygons. The names of common 3D shapes. Nets and isometric drawing. Read scale maps and drawings. Record and calculate with bearings. The conditions for triangles to be congruent. Bisectors of angles and lines. Perpendicular lines. Loci. Plans and elevations.</p> <p>Understanding: Select appropriate properties to solve a problem. Use correct terminology to explain workings. Give evidence of properties.</p> <p>Skills: Recognise angles on a straight line, at a point and vertically opposite angles and use these to solve problems. Solve problems involving the internal and external angles of polygons. Use key words and terms. Sketch diagrams from worded information.</p>	<p>Students can: Solve angle problems giving reasons for each step. Apply angle facts to solve problems such as whether combinations of regular polygons will tessellate. Make links between 3D shapes and their 2D representations. Use accurate drawings to solve loci problems. Use the internal and external angles of polygons. Relate learning to other topics such as using measuring instruments. Relate learning to other subject areas, such as technology, geography and art.</p>	<p>Year 7 Unit 6: Meanings of key words linked to angles, acute, obtuse, reflex, right. Names and properties of quadrilaterals. Definition of diagonal, perpendicular and parallel.</p> <p>Year 7 Unit 12: recognise and solve problems using angles in a triangle, angles at a point, angles in quadrilateral</p> <p>Year 8 Unit 3: Use of scale diagrams</p> <p>Year 8 Unit 9: Solving problems linked to alternate and corresponding angles separately</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

	<p>Match 3D shapes to their nets. Represent 3D shapes on isometric paper. Draw the plans and elevations of 3D shapes Draw and interpret scale drawings, including the use of bearings. Construct accurate diagrams using a ruler and compass. Bisect angles and lines. Determine whether triangles are congruent giving a reason. Use accurate drawings to find the loci of points that conform to a given rule.</p>			
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Mathematics - Year 9 Unit 11

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Transformations</p>	<p>Knowledge: Recognise all four transformations and their properties. The equations of vertical and horizontal lines, $y = x$ and $y = -x$.</p> <p>Understanding: Predict effects of transformations. Fully describe all four transformations. Carry out all four transformations. Perform multi-step transformations.</p> <p>Skills: When necessary, use tracing paper and measuring instruments when drawing or describing transformations. Make accurate drawings, erasing errors as required.</p>	<p>Students can: Explain and identify the effects of performing any transformation. Perform and explain combined transformations and the importance of order of the operations. Describe a single transformation that is equivalent to combined transformations. Relate learning to other topics such as area and co-ordinates. Relate learning to other subject areas, such as technology, geography and art.</p>	<p>Year 7 Unit 5: Rotational Symmetry. Line symmetry. Use of a pair of compasses.</p> <p>Year 7 Unit 16: Drawing lines $X=+/-a$ $Y=+/-a$ $Y=X$ $Y=-X$ Plotting co-ordinates in all four quadrants. Construct and describe rotations, reflections and translations.</p> <p>Year 8 Unit 3: Enlargement with positive scale factors. Use of scale drawings.</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

Mathematics - Year 9 Unit 12

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Area and perimeter</p>	<p>Knowledge: Formulae for the area and circumference of a circle. Formulae for the area of a triangle, rectangle, parallelogram and trapezium. Formula for arc length. Formulae for the area and perimeter of a sector. Formulae for the volumes and surface areas of prisms, pyramids, cylinders and spheres.</p> <p>Understanding: Combine formulae to solve problems. Split shapes to solve problems with complex shapes. To select the correct formulae, use as required and give the correct units.</p> <p>Skills: Substitute into formulae. Rearrange formulae to find required values. Convert between units.</p>	<p>Students can: Split a problem into manageable chunks. Find the appropriate value when presented with compound shapes. Demonstrate relationships by changing lengths and the effect on area and volume. Correctly apply formulae and change the subject of the formulae. Apply previous knowledge such as compound measures. Apply to real life applications and worded problems. Apply to other subject areas, such as technology and science.</p>	<p>Year 7 Unit 15: Calculating space – perimeter and area</p> <p>Year 8 Unit 12: Calculating space – area and circumference formulae for circles</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>

Mathematics - Year 9 Unit 13

What are we learning?	What knowledge, understanding and skills will we gain?	What does mastery look like?	How does this build on prior learning?	What additional resources are available?
<p>Equations of lines</p>	<p>Knowledge: Write and read coordinates in all 4 quadrants. Gradient and y-intercept of a straight line. $y = mx + c$ is the general equation of any straight-line graph and what the individual letters within this mean. Conversion graphs and how to read them. Parallel lines have the same gradient.</p> <p>Understanding: Gradient is a measure of steepness. Steep graphs have a large gradient, shallow ones have a smaller gradient. The points on a line satisfy the rule given by the equation. There are different methods to draw a straight-line graph and how to decide which one is best to use. Select an appropriate method to find the equation of a straight line. Accurately interpret conversion graphs.</p> <p>Skills: Plot a straight-line graph using a table of coordinates/values. Calculate the gradient of a straight-line graph. Find the equation of a straight-line graph using $y = mx + c$. Use a conversion graph by reading off values. Solve simultaneous linear equations graphically.</p>	<p>Students can:</p> <p>Interpret the gradient and y-intercept of a straight line in a real context. Find the equation of a parallel line. Use graphs to work out formulae. Use graphs to solve simultaneous linear equations and understand why the method works.</p> <p>Apply previous knowledge such as co-ordinates. Apply to real life applications and worded problems. Apply to other subject areas, such as science, technology and geography</p>	<p>Year 8 Unit 13: Algebraic Proficiency – visualising</p>	<p>White Rose resources BBC bitesize Mymaths.co.uk Hegarty Maths lessons</p>