



Year 9 Mathematics Curriculum Overview

Please note that the placements of each unit are approximate.

	Units and Objectives
Autumn	Unit 1 – Scatter Graphs • draw scatter graphs • draw a line of best fit • describe the relationship between two sets of data • use a line of best fit, or otherwise, to predict values of a variable given values of the other variable • interpolate and extrapolate apparent trends whilst knowing the disadvantages of doing so • identify outliers and ignore them on scatter graphs • explain an isolated point on a scatter graph • distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem • understand that correlation does not imply causality, and appreciate that correlation is a measure of the strength of the association between two variables and that zero correlation does not necessarily imply ‘no relationship’ but merely ‘no linear correlation’ Unit 2 – Indices, Reciprocals and Roots • recall that $n^{-1} = \frac{1}{n}$, $n^{\frac{1}{2}} = \sqrt{n}$ and $n^{\frac{1}{3}} = \sqrt[3]{n}$ for any positive integer n • find the value of calculations using negative and fractional indices • use index laws to both simplify algebraic expressions and calculate the value of numerical expressions involving negative and fractional powers • use index laws to simplify and calculate the value of numerical expressions involving change of bases Unit 3 – Problem Solving with Ratio and Proportion • write a ratio as a fraction • express a multiplicative relationship between two quantities as a ratio or a fraction, e.g. when $A:B$ are in the ratio 3:5, A is $\frac{3}{5}B$. When $4a = 7b$, then $a = \frac{7b}{4}$ or $a:b$ is 7:4 • write a ratio as a linear function • use a ratio to convert between measures and currencies • problem solve using ratios and direct proportion

Unit 4 – Angles, Polygons and Parallel Lines

- solve missing angle problems using both the properties of angles in parallel lines and simple polygons such as triangles and quadrilaterals
- understand ‘regular’ and ‘irregular’ when applied to polygons
- derive and use the sum of the interior angles of an n -sided polygon
- use the angle sum in any polygon to derive the properties of regular polygons
- use the sum of the exterior angles of any polygon is 360°
- use the sum of the interior angle and the exterior angle is 180°
- find the number of sides of a regular polygon
- use angle facts to demonstrate how shapes would ‘fit together’ and work out interior angles of shapes in a pattern

Unit 5 – Surds

- understand surd notation (e.g. calculator gives answer to $\sqrt{8}$ as $2\sqrt{2}$)
- simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$)
- use multiplication and division rules to simplify surds
- add and subtract surds
- rationalise the denominator in simple cases (e.g. $\frac{3}{\sqrt{2}}$ and $\frac{5}{2\sqrt{2}}$)

Unit 6 – Pythagoras’ Theorem and Trigonometry

- solve problems involving Pythagoras’ theorem including cases involving algebra
- understand, use and recall the trigonometric ratios sine, cosine and tan
- apply trigonometric ratios to find lengths and angles in right-angled triangles
- find angles of elevation and depression
- know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90°
- know the exact values of $\tan \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and 60°
- solve problems involving both Pythagoras’ theorem and trigonometric ratios

Unit 7 – Linear Simultaneous Equations and Inequalities

- form and solve linear equations from worded problems involving area and perimeter
- solve simultaneous equations where neither equation requires scaling
- solve simultaneous equations where one or both equations require scaling
- form an inequality from a number line
- show an inequality on a number line
- solve linear inequalities showing the solution set on a number line
- solve two linear inequalities in x , find the solution sets and compare them to see which value of x satisfies both

Spring	Unit 8 – Quadratic, Cubic, Reciprocal and Circle Graphs • generate points and plot graphs of simple quadratic functions, and then more general quadratic functions • find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function • draw graphs of simple cubic functions using tables of values • draw graphs of the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$ using tables of values • draw circles, centre the origin, equation $x^2 + y^2 = r^2$ • recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape Unit 9 – HCF, LCM and Venn Diagrams • problem solve using HCF and LCM, and prime numbers • sort a list of elements into a Venn diagram • solve problems with Venn diagrams such as calculating the number of elements in a set • use union, intersection and complement notation Unit 10 – Calculating with Recurring Decimals • convert a complex recurring decimal to a fraction • by writing the denominator in terms of its prime factors, decide whether fractions can be converted to recurring or terminating decimals • add, subtract, multiply and divide recurring decimals by converting them into fractions Unit 11 – Expanding and Factorising Quadratics • expand the product of two linear expressions, i.e. double brackets working up to negatives in both brackets and similar to $(2x + 3y)(3x - y)$ • know that squaring a linear expression is the same as expanding double brackets • factorise quadratic expressions of the form $ax^2 + bx + c$ when $a = 1$ • factorise quadratic expressions of the form $ax^2 + bx + c$ when $a \neq 1$ • factorise quadratic expressions using the difference of two squares • set up and solve quadratic equations by factorisation including those that need rearranging Unit 12 – Conditional Probability • use a tree diagram to calculate probabilities of two or more successive conditional (dependent) events • use a two-way table to calculate probabilities and conditional probabilities • use the product rule for counting (i.e. if there are m ways of doing one task and for each of these, there are n ways of doing another task,
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	then the total number of ways the two tasks can be done is $m \times n$ ways) Unit 13 – Parallel and Perpendicular Lines • identify and interpret the gradient from an equation $ax + by = c$ • find the equation of a straight line from a graph in the form $ax + by = c$ • plot and draw graphs of straight lines in the form $ax + by = c$ • know that parallel lines have the same gradient • determine the equation of a parallel line • know that the gradient of a perpendicular line is $-\frac{1}{m}$ • determine the equation of a perpendicular line • determine if two straight-line graphs are parallel, perpendicular or neither by rearranging into $y = mx + c$ • solve geometrical problems involving linear graphs • find the coordinates of points identified by geometrical information including cases when relationships between coordinates are expressed using ratios
Summer	Unit 14 – Standard Form and Accuracy • use inequality notation to specify simple error intervals due to truncation or rounding • convert large and small numbers into standard form and vice versa • interpret a calculator display using standard form and know how to enter numbers in standard form • add, subtract, multiply and divide in standard form • adjust numbers into standard form Unit 15 – Real-life Graphs • use distance-time graphs to calculate various measures (of individual sections) including average speed, distance and time • draw and interpret velocity-time graphs to calculate various measures including distance • draw and interpret straight-line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills, fixed charge and cost per item Unit 16 – Applications of Sequences • use the nth term of a linear sequence to decide if a given number is a term in the sequence, or find the first term above or below a given number • continue a quadratic sequence and use the nth term to generate terms • find the nth term of quadratic sequences • solve problems involving linear and quadratic sequences

Unit 17 – Arcs and Sectors

- calculate arc lengths of sectors of circles and use these to find missing angles
- calculate areas of sectors of circles and use these to find missing angles
- give answers in terms of π
- use $\pi \approx 3.142$ and use the π button on a calculator
- form equations including quadratics involving more complex shapes and solve these equations

Unit 18 – Completing the Square and the Quadratic Formula

- complete the square when the coefficient of x^2 is one
- solve quadratic equations by completing the square when the coefficient of x^2 is one including cases that require rearranging first
- recall the quadratic formula
- solve quadratic equations by using the quadratic formula (including cases that require rearranging) giving answers to a required degree of accuracy or exactly
- set up and solve quadratic equations

Unit 19 – Statistical Diagrams

- interpret cumulative frequency graphs including estimating frequency greater/less than a given value and finding the median and quartile values and interquartile range
- relate box plots to cumulative frequency graphs
- compare the mean and range of two distributions, or median and interquartile range, as appropriate
- construct and interpret stem-and-leaf diagrams (including back-to-back diagrams) by finding the mode, median, range, as well as the greatest and least values
- produce and interpret frequency polygons for grouped data