



Year 11 Mathematics Curriculum Overview

Please note that the placements of each unit are approximate.

	Units and Objectives
Autumn	Unit 1 – Circle Theorems - recall the definition of a circle, and both identify and draw parts of a circle including a sector, tangent, chord and segment - find and give reasons for missing angles on diagrams using isosceles triangles in circles - find and give reasons for missing angles on diagrams using the fact that the angle in a semicircle is a right-angle - find and give reasons for missing angles on diagrams using the fact that the angle between a tangent and a radius is 90° (i.e. the tangent at any point on a circle is perpendicular to the radius at that point) - find and give reasons for missing angles on diagrams using the fact that tangents from an external point are equal in length - find and give reasons for missing angles on diagrams using the fact that the perpendicular from the centre of a circle to a chord bisects the chord - find and give reasons for missing angles on diagrams using the fact that the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference - find and give reasons for missing angles on diagrams using the fact that angles in the same segment are equal - find and give reasons for missing angles on diagrams using the fact that opposite angles of a cyclic quadrilateral sum to 180° - find and give reasons for missing angles on diagrams using the alternate segment theorem Unit 2 – Circle Geometry - recognise and construct the graph of a circle using $x^2 + y^2 = r^2$ for radius r centred at the origin - find the equation of a tangent to a circle (centre origin) at a given point by finding the gradient of the radius that meets the circle at the point, finding the gradient of the tangent perpendicular to it and using the coordinates of the given point Unit 3 – Changing the Subject of a More Complex Formula - change the subject of a formula including cases involving fractions or where a power of the subject appears - change the subject of a formula such as $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ where all variables are in the denominators

	- change the subject of a formula including cases where the subject appears on both sides of a formula or appears more than once Unit 4 – Algebraic Fractions - simplify algebraic fractions - add, subtract, multiply and divide algebraic fractions - solve quadratic equations arising from algebraic fraction equations Unit 5 – Rationalising Surds - rationalise the denominator involving surds Unit 6 – Algebraic Proof - solve ‘Show that’ and proof questions using consecutive integers (n, $n + 1$), squares a^2, b^2, even numbers $2n$, odd numbers $2n + 1$ Unit 7 - Iteration - use iterative formulae to generate values including in contextual situations - use a change of sign method to demonstrate a solution to an equation lies within a given interval - use iterative methods to find approximate solutions to equations within a given interval - use recursive iteration to find increasingly accurate solutions to a given equation - understand that rearranging a recursive iterative formula gives the equation being solved approximately - calculate the resultant of two vectors - find the length of a vector using Pythagoras’ Theorem - solve geometric problems in 2D where vectors are divided in a given ratio - produce geometrical proofs to prove points are collinear and vectors/lines are parallel
Spring	Unit 8 - Functions - use function notation - find $f(x) + g(x)$ and $f(x) - g(x)$, $2f(x)$, $f(3x)$ etc algebraically - for two functions $f(x)$ and $g(x)$, find $gf(x)$ - find the inverse of a linear function - know that $f^{-1}(x)$ refers to the inverse function Unit 9 – Vectors and Geometric Proof - understand and use vector notation, including column notation, and understand and interpret vectors as displacement in the plane with an associated direction

- understand that $2\mathbf{a}$ is parallel to $\mathbf{a}$ and twice its length, and that $\mathbf{a}$ is parallel to $-\mathbf{a}$ in the opposite direction.
- represent vectors, combinations of vectors and scalar multiples in the plane pictorially
- calculate the sum of two vectors, the difference of two vectors and a scalar multiple of a vector using column vectors (including algebraic terms)

Unit 10 – Transformations of Graphs

- interpret and analyse transformations of graphs of functions and write the functions algebraically, e.g. write the equation of $f(x) + a$, or $f(x - a)$
- apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$ and $y = f(x + a)$ for linear, quadratic, cubic functions
- apply to the graph of $y = f(x)$ the transformations $y = -f(x)$ and $y = f(-x)$ for linear, quadratic, cubic functions

Unit 11 – Exponential and Reciprocal Graphs

- recognise, sketch and interpret graphs of the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$
- state the value of x for which the equation is not defined
- recognise, sketch and interpret graphs of exponential functions $y = k^x$ for positive values of k and integer values of x
- set up, solve and interpret the answers in growth and decay problems

Unit 12 – Estimating Gradients and Areas Under Graphs

- interpret the gradient of linear or non-linear graphs, and estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient
- interpret the gradient of a linear or non-linear graph in financial contexts
- interpret the rate of change of graphs of containers filling and emptying
- interpret the rate of change of unit price in price graphs
- for a non-linear distance–time graph, estimate the speed at one point in time, from the tangent, and the average speed over several seconds by finding the gradient of the chord
- for a non-linear velocity–time graph, estimate the acceleration at one point in time, from the tangent, and the average acceleration over several seconds by finding the gradient of the chord
- estimate area under a quadratic or other graph by dividing it into trapezia
- interpret the area under a linear or non-linear graph in real-life contexts

	Unit 13 – Direct and Inverse Proportion • recognise graphs of direct proportion • write statements of proportionality for quantities proportional to the square, cube or other power of another quantity • set up and use equations to solve word and other problems involving direct proportion • recognise graphs of inverse proportion • write statements of proportionality for quantities inversely proportional to the square, cube or other power of another quantity • set up and use equations to solve word and other problems involving inverse proportion
Summer	Revision