



Key Stage 4: Year 11

Subject: Mathematics

Aims of the subject:

The mathematics department aim to develop the full potential of every student in the subject. It is our aim to ensure that every pupil experiences success and enjoyment in the subject, whether it be equipping them with sufficient mathematical skills for everyday life or developing problem solving and reasoning skills to take them beyond GCSE.

The Mathematics scheme of learning is divided into units of study consisting of interlinking skills and topics. For each unit of study, pupils will complete a weekly homework and key skills tests. Students are assessed formally by mini mock exam in October and mock exams in late November/early December and Easter. The interactive resource, MathsWatch, is used throughout KS4 in classroom teaching and homework setting.

Year 11 – Phase 5 (Sets P, L and E)

		What will I learn?
Term 1	Unit 1	<ul style="list-style-type: none"> • know the difference between an equation and an identity • argue mathematically to show algebraic expressions are equivalent and use algebra to support and construct • simplify and manipulate algebraic expressions by expanding products of two binomials • factorise quadratic expressions of the form x^2+bx+c including the difference of two squares • solve quadratic equations by factorising • solve quadratic equations graphically • identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically
	Unit 2	<ul style="list-style-type: none"> • calculate arc lengths, angles and areas of sectors of circles (including giving answers in terms of π) • working backwards to find the radius/diameter given the area or arc length • calculate the volume of spheres, pyramids, cones and composite solids (include working backwards to find the radius/diameter) • calculate the surface area of spheres, pyramids, cones and composite solids (include working backwards to find the radius/diameter)

	Unit 3	<ul style="list-style-type: none"> understand and use the concepts and vocabulary of expressions, terms, equations, factors, identity, inequality and formulae solve linear inequalities in one variable and represent the solution on a number line solve two linear simultaneous equations in two variables algebraically and graphically combine 2 two-part ratios to one three-part ratio (i.e. $A:B=5:6$, $B:C=8:11$, work out $A:C$ in its simplest form)
Term 2	Unit 4	<ul style="list-style-type: none"> calculate the probability of independent and dependent combined events, including using tree diagrams and other representations and know the underlying assumptions know different types of sampling including random, systematic and stratified sampling (please note, questions may not explicitly use the phrase 'stratified sample') know the advantages and disadvantages of different sampling methods including bias calculate the estimate of the mean, the interval containing the median and modal class for a grouped frequency table construct and interpret frequency tables and bar charts for grouped continuous data apply statistics to describe a population, using measures of central tendency and measures of dispersion
	Unit 5	<ul style="list-style-type: none"> understand congruence and identify shapes that are congruent understand and use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS) understand similarity of triangles and of other plane figures and identify shapes that are similar including all squares, all circles or all regular polygons with equal number of sides apply the concepts of similarity including the relationships between lengths to find missing lengths in similar figures understand, recall and use trigonometric relationships in right-angled triangles, including problems involving bearings know the exact values of $\sin x$ and $\cos x$ for $x=0, 30, 45, 60$ and 90 and know the exact value of $\tan x$ for $x=0, 30, 45$ and 60
Term 3	Unit 6	<ul style="list-style-type: none"> draw, sketch, recognise and interpret quadratic graphs, simple cubic graphs and the reciprocal function plot and interpret graphs (including reciprocal and non-standard function) in real contexts to find approximate solutions to contextual problems such as simple kinematic problems involving distance, speed and acceleration interpret the gradient of a straight line graph as a rate of change set up, solve and interpret answers in growth and decay problems calculate problems which involve simple/compound interest solve percentage problems involving the original value understand that an equation of the form $y=kx$ represents direct proportion and the k is the constant of proportionality understand that an equation of the form $y=k/x$ represents inverse proportion and that k is the constant of proportionality

Phase 6 (Sets M, A, R and I)

		What will I learn?
Term 1	Unit 1	<ul style="list-style-type: none"> • use the fact that the tangent at any point on a circle is perpendicular to the radius at that point • use the fact that tangents from an external point are equal in length • use the fact that the perpendicular from the centre to a chord bisects the chord • use 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 • use the fact that the angle subtended at the circumference by a semicircle is a right angle • use the fact that angles in the same segment are equal • use the fact that opposite angles of a cyclic quadrilateral sum to 180° • use the alternate segment theorem
	Unit 2	<ul style="list-style-type: none"> • expand products of three binomials • solve quadratic equations by completing the square • solve quadratic equations by using the quadratic formula • factorise quadratic expressions where coefficient of $x^2 > 1$ • form and solve quadratic equations including those that require rearrangement • know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent and use algebra to support and construct arguments and proofs
	Unit 3	<ul style="list-style-type: none"> • simplify surds • rationalise a denominator • simplify expressions using the rules of surds • expand brackets where the terms may be written in surd form • solve equations which may be written in surd form • change recurring decimals into their corresponding fractions and vice versa
Term 2	Unit 4	<ul style="list-style-type: none"> • calculate values using fractional indices • use index laws for multiplication and division of positive, negative and fractional indices • understand that x is inversely proportional to $1/y$; construct and interpret equations that describe direct and inverse proportion

	Unit 5	<ul style="list-style-type: none"> • use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method • find approximate solutions to equations numerically using iteration • model growth and decay problems mathematically • solve growth and decay problems, for example using multipliers or an iterative process • understand that some iterations may have a limiting value • draw an exponential graph and understand the main features of an exponential graph • convert between a ratio and its formula and be able to apply this to a problem ($x:y=7:4$ $x=\frac{7y}{4}$)
Term 3	Unit 6	<ul style="list-style-type: none"> • calculate quartiles and interquartile range from a small set of data • construct cumulative frequency graphs for grouped discrete and continuous data • estimate values from a cumulative frequency graph including lower quartile, upper quartile, median • construct and interpret a box plot • construct and interpret histograms with equal and unequal intervals for grouped discrete and continuous data • use a histogram to estimate the median and estimate frequencies • compare two distributions to make decisions about a hypothesis using diagrams and by comparing a suitable measure of average and measure of spread • interpret, analyse and compare the distributions of data sets using boxplots and appropriate measures of central tendency and spread, including quartiles, medians and inter-quartile range • calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams • apply the product rule for counting to calculate the number of combinations/permutations of a particular event

Phase 7 (Sets T, H and O)

		What will I learn?
Term 1	Unit 1	<ul style="list-style-type: none"> recognise and use sequences of geometric progressions (r^n where n is an integer and r is a rational number > 0 or a surd, and other sequences calculate the nth term of quadratic sequences
	Unit 2	<ul style="list-style-type: none"> solve simple geometric problems in 2D using vector methods apply vector methods for simple geometric proofs recognise when lines are parallel using vectors recognise when three or more points are collinear using vectors use vectors to show three or more points are collinear
	Unit 3	<ul style="list-style-type: none"> solve quadratic equations by factorising (including where coefficient of x^2 is greater than 1) and using the quadratic formula simplify and manipulate algebraic expressions involving algebraic fractions solve equations involving algebraic fractions
Term 2	Unit 4	<ul style="list-style-type: none"> solve two linear simultaneous equations in two variables algebraically and graphically solve two simultaneous equations (one linear, one quadratic) algebraically (include examples where one equation is the equation of a circle) solve quadratic equations graphically identify and interpret roots, intercepts and turning points of quadratic functions graphically solve two simultaneous equations (one linear, one quadratic) graphically solve linear inequalities in one or two variables; represent the solution on a number line, using set notation and on a graph solve quadratic inequalities in one variable; represent the solution set on a number line, using set notation and on a graph

	Unit 5	<ul style="list-style-type: none"> • solve quadratic equations by completing the square • deduce turning points by completing the square • recognise, sketch and interpret graphs of exponential functions, trigonometric functions $y=\sin x$ and $y=\tan x$ with angles of any size in degrees • transform the graph of any function $f(x)$ including: $f(x) + a$, $f(x + b)$, $-f(x)$ and $f(-x)$ where a and b are integers • recognise transformations of functions and be able to write down the function of a transformation given the original function
Term 3	Unit 6	<ul style="list-style-type: none"> • recognise and use the equation of a circle with centre at the origin • find the gradient of a line that is perpendicular to a given line and hence the equation of a line perpendicular to a given line and passing through a given point • show that 2 lines are perpendicular • use the fact that the angle between a tangent and radius is 90°, to work out the gradient of a tangent and hence the equation of a tangent at a given point
	Unit 7	<ul style="list-style-type: none"> • understand the tangent at any point on a circle is perpendicular to the radius at that point • understand and use the fact that tangents from an external point are equal in length • use congruent triangles to explain why the perpendicular from the centre to a chord bisects the chord • understand that inscribed regular polygons can be constructed by equal division of a circle • prove and use 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 • prove and use the fact that the angle subtended at the circumference is a right angle • prove and use the fact that angles in the same segment are equal • prove and use the fact that opposite angles of a cyclic quadrilateral sum to 180° • prove and use the alternate segment theorem
	Unit 8	<ul style="list-style-type: none"> • interpret the meaning of a gradient as a rate of change; understand the difference between positive and negative gradients as rates of change • estimate the gradient at a point on a curve by drawing a tangent at that point and working out the gradient and interpret the results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts • understand that the gradient of a speed/velocity graph represents acceleration and the gradient of a distance/time graph represents speed • understand that the rate of change at a particular instant is represented by the gradient of the tangent of the curve at that point • calculate or estimate the area under a graph (using trapezia, triangles and rectangles for curves) and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts

Extra-curricular opportunities

- UKMT Intermediate Maths Challenge (Set T)
- Enter the Half-Termly Maths Competition

How you can support your child's progress

- Practise mental maths skills i.e. addition, subtraction, multiplication and division
- Seek real life opportunities to challenge your child's mathematical knowledge for example calculating best buys, calculating how many pots of paint required to decorate a room etc.
- Encourage your child to use NRich.co.uk to access 'rich tasks'
- Attend lunchtime support sessions for help with homework and revision
- Attend weekly and termly GCSE revision sessions
- Maths exam revision packs containing sample GCSE papers are available to purchase from school in January each year; ideal for class use and independent study at home