



Key Stage 4: Year 10

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 unit quizzes. Students are assessed formally by way of assessments in the Autumn, Spring and Summer terms, plus end of year exam. The interactive resource, MathsWatch, is used throughout KS4 in classroom teaching and homework setting.

Year 10 – Phase 4 (Sets P, L and E)

		What will I learn?
Term 1	Unit 1	<ul style="list-style-type: none"> • convert numbers between ordinary numbers and standard form and vice versa • order and compare numbers which have been written in standard form • calculate problems with numbers in standard form without a calculator • solve problems involving standard form with a calculator • solve simple equations where the numbers are written in standard form • calculate with positive and negative integer indices • use compound units such as speed, density and pressure to solve problems • solve problems with compound units where a change of units is required, including finding average speed • change freely between related standard units (for example speed, density and pressure)
	Unit 2	<ul style="list-style-type: none"> • form and solve linear equations with integer coefficients where the unknown appears on both sides and where the equation involves brackets • understand and use the concepts and vocabulary of expressions, terms, equations, factors and formulae • represent the ratio of two quantities which are in direct proportion as a linear relationship and represent graphically • solve problems involving direct and inverse proportion by graphical and algebraic approaches • model situations or procedures by translating them into algebraic formulae and by using graphs

	Unit 3	<ul style="list-style-type: none"> • rearrange formulae where the subject appears once or can be collected as a like term (include examples involving square, square roots, cube and cube roots) • identify and apply circle definitions and properties including radius, diameter, circumference, sector, segment, tangent and arc • recall and use the formula for circumference of a circle including being able to find the radius/diameter when given the area (including being able to give answers in terms of pi) • recall and use the formula for volume and surface area of a cylinder • understand, recall and use Pythagoras' Theorem in 2D problems
Term 2	Unit 4	<ul style="list-style-type: none"> • identify and interpret gradients and intercepts of linear functions graphically and algebraically; recognise that equations of the form $y=mx+c$ correspond to straight line graphs • draw graphs of functions in which y is given explicitly or implicitly in terms of x • find the midpoint of a line segment or the coordinates of a point for a given ratio along a line • work out the gradient and find the equation of a straight line given 2 points or given one point and the gradient • manipulate equations so that it is possible to tell whether lines are parallel or not; show that 2 lines are parallel • plot a graph representing a real-life problem from information given in words, in a table or as a formula • draw and interpret linear graphs and piece-wise linear graphs representing real-life situations • plot and interpret distance-time graphs
	Unit 5	<ul style="list-style-type: none"> • complete a frequency table for the outcomes of an experiment • understand and use the term relative frequency and use relative frequency to estimate probabilities • consider differences between theoretical probability and relative frequency in a practical situation • understand and use a Venn diagram consisting of a universal set and at most two sets, which may or may not intersect including shading areas and solving problems • construct and use Venn diagrams to solve problems involving probability including set notation, i.e. $P(A)$ $P(A')$ $P(A \cup B)$ $P(A \cap B)$ • design, use and complete two way tables • complete a frequency tree and use a frequency tree to compare frequencies of outcomes • calculate the mean, median, mode and range of an <u>ungrouped</u> frequency table • analyse and compare the distributions of data using graphical distributions and suitable measures of spread and average, including commenting on outliers • plot, interpret and use a time-series graph • understand that if data points are joined with a line then the line will not represent actual values but will show a trend

Term 3	Unit 6	<ul style="list-style-type: none"> • describe and transform 2D shapes using single rotations • describe and transform 2D shapes using single reflections including finding the equation of the line of reflection • describe and transform 2D shapes using translation by vector notation • column vector calculations • describe and transform 2D shapes using enlargements by a positive scale factor (including fractional scale factors) • identify the scale factor of an enlargement as the ratio of the lengths of two corresponding sides • using a straight edge and compasses to complete standard constructions including; equilateral triangle, perpendicular bisector, perpendicular at AND from a given point on a given line and an angle bisector • draw circles or part circles when given the radius or diameter • use the standard constructions to construct loci (e.g. A fixed distance from a point and a fixed distance from a given line, given equal distances from two points, given equal distances from 2 line segments, less than a given distance or greater than a given distance from a point or line segment) • describe regions satisfying several conditions • work out missing angles using properties of alternate, corresponding and co-interior angles including examples involving parallelograms including giving reasons for answers • recall and use the eight points of the compass and their equivalent three figure bearings • use, measure and draw bearings including on scale drawings
--------	--------	--

Phase 5 (Sets M, A, R and I)

		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 T, H and O)

		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 or 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

Extra-curricular opportunities

- UKMT Intermediate Maths Challenge (Set 1)
- 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