

# Maths



**KEMNAL HEARTS**



**KEMNAL MINDS**

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## Curriculum Overview

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Year 7		Numeracy. Analysing and Displaying data. Expressions, functions and Formulae. Angles.	Numeracy. Decimals and Measures. Fractions and Percentages.	Numeracy. Probability. Ratio and Proportion.	Numeracy. Lines and Angles. Algebra. Percentages.	Numeracy. Sequences and Graphs. Perimeter, Area and Volume.
Year 8	Numeracy. Ratio and Proportion.	Numeracy. Area and Volume. Angles. Statistics, Graphs and Charts.	Numeracy. Expressions and Equations. Fractions. Real Life Graphs.	Numeracy. Decimals and Ratio. Lines and Angles.	Numeracy. Algebra. Fractions. Percentages.	Numeracy. Straight-Line Graphs. Perimeter, Area and Volume. PDF.

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<b>Year 9</b>	Numeracy. Ratio and Proportion.	Numeracy. Indices and Standard Form. Angles. Dealing with Data.	Numeracy. Constructions. Fractions. Sequences, Inequalities, Equations and Proportion.	Numeracy. Circles, Pythagoras and Prisms. Graphs.	Numeracy. Algebra. Probability. Percentages.	Numeracy. Comparing Shapes. Perimeter, area and Volume. Number. Ratio and Proportion.
<b>Year 10 Foundation</b>	Expressions. Substituting. Expanding and Factorising. Interpreting and Representing Data.	Numeracy. Number. Expressions. Angles. Substituting. Expanding and Factorising.	Numeracy. Interpreting and Representing Data. Fractions and Percentages.	Numeracy. Equations, Inequalities and Sequences. Angles.	Numeracy. Averages and Range. Percentages. Algebra.	Numeracy. Perimeter, Area and Volume. Graphs.
<b>Year 10 Higher</b>	Numeracy. Transformations. Ratio and Proportion.	Number. Expressions. Substitution. Expanding and Factorising. Sequences. Inequalities. Simple Proofs	Interpreting and representing Data. Fractions, Percentages, Ratio and Proportion.	Angles and Trigonometry. Graphs.	Area and Volume. Accuracy and Bounds. Algebra. Percentages.	Transformation and Construction. Perimeter, Area and Volume. Equations and Inequalities.
<b>Year 11 Foundation</b>	Probability. Ratio and Proportion.	Ratio and proportion. Right angled Triangles. Probability. Multiplicative Reasoning.	Construction, Loci and Bearings. Quadratic Equations and Graphs. Mock Exams.	Perimeter, Area and Volume. Fractions, Indices and Standard Form.	Algebra. Revision	

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				Congruence, Similarity and Vectors.		
<b>Year 11 Higher</b>		Multiplicative Reasoning. Similarity and Congruence. Further Trigonometry. Accuracy and Bounds. Statistics.	Mock Exams. Equations and Graphs. Circle Theorems.	Algebra. Vectors and Proofs. Proportion and Graphs.	Revision.	

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## Curriculum Enriching Opportunities

Curriculum Enriching Opportunities					
	Year 7	Year 8	Year 9	Year 10	Year 11
Suggested Reading	50 mathematical ideas you really need to know - Tony Crilly	How many socks make a pair - Rob Eastaway	Alex's adventures in numberland - Alex Bellos	How to cut a cake: and other mathematical conundrums - Ian Stewart	The imagination game - Jim Ottoviani
Suggested Viewing		The Da vinci code?	Christmas Lectures?	A beautiful mind?	The man who knew infinity?

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## Links To The National Curriculum

Code	<p style="text-align: center;"><b>The National Curriculum</b>  <b>Statement from EDEXCEL Specification for GCSE (9-1) Mathematics</b>  <b>Number:</b></p>	<p style="text-align: center;"><b>KTC</b>  <b>reference to</b>  <b>the National</b>  <b>Curriculum</b></p>
N1	Order positive and negative integers, decimals, and fractions; use the =, ≠, <, >, ≤, ≥.	Y7 - T2, T3 Y8 - T4, T5.
N2	Apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers - all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals).	Y7 - T2, T3, T4, Y8 - T2, T4, T6.
N3	Recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions; use conventional notation for priority of operations, including brackets, powers, roots and reciprocals.	Y7 - T3, Y8 - T2.
N4	Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem.	Y7 - T2, Y8 - T2.
N5	Apply systematic listing strategies, including the use of 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, then the total number of ways the two tasks can be done is m x n ways).	Yr 7- T2
N6	Use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5; estimate powers and roots of any given positive number.	Y7 - T2, Y8 - T2.
N7	Calculate with roots, and and with integer and fractional indices.	
N8	Calculate exactly with fractions, surds and multiples of $\pi$ , simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}$ ) and rationalise denominators.	Y7 - T4, Y8 - T6.
N9	Calculate with and interpret standard form $A \times 10^n$ , where $1 < A < 10$ and n is an integer.	
N10	Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 or $\frac{3}{8}$ ); change recurring fractions into their corresponding fractions and vice versa.	Y7 - T4, Y8 - T7.
N11	Identify and work with fractions in ratio problems.	
N12	Interpret fractions and percentage operators	Y7 - T4, Y8 - T7.
N13	Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal	Y7 - T2, T3.

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	quantities where appropriate.	
N14	Estimate answers; check calculations using approximation and estimation, including answers obtained using technology	Y7 - T2.
N15	Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding.	Y7 - T2, T3, Y8 - T4.
N16	Apply and interpret limits of accuracy, including upper and lower bounds.	

Code	The National Curriculum Statement from EDEXCEL Specification for GCSE (9-1) Mathematics  Algebra:	KTC reference to the National Curriculum
A1	Use and interpret algebraic manipulation, including: <ul style="list-style-type: none"> <li>● <math>ab</math> in place of <math>a \times b</math>,</li> <li>● <math>3y</math> in place of <math>y + y + y</math> and <math>3 \times y</math>,</li> <li>● <math>a^2</math> in place of <math>a \times a</math>, <math>a^3</math> in place of <math>a \times a \times a</math>, <math>a^2b</math> in place of <math>a \times a \times b</math>,</li> <li>● <math>a/b</math> in place of <math>a \div b</math>,</li> <li>● Coefficients written as fractions rather than decimals,</li> <li>● brackets.</li> </ul>	Y7 - T2, Y8 - T3.
A2	Substitute numerical values into formulae and expressions, including scientific formulae.	Y7 - T3, Y8 - T3.
A3	Understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors.	Y7 - T3, Y8 - T3.
A4	Simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by: <ul style="list-style-type: none"> <li>● Collecting like terms,</li> <li>● Multiplying a single term over a bracket,</li> <li>● Taking out common factors,</li> <li>● Expanding products of two or more binomials,</li> <li>● Factorising quadratic expressions of the form <math>x^2 + bx + c</math>, including the difference of two squares; factorising quadratic expressions in the form <math>ax^2 + bx + c</math>,</li> <li>● Simplify expressions involving sums, products and powers, including the laws of indices.</li> </ul>	Y7 - T3, Y8 - T3.
A5	Understand and use standard mathematical formulae; rearrange formulae to change the subject.	Y8 - T3
A6	Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are	Y8 - T23

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	equivalent, and use algebra to support and construct arguments and proofs.	
A7	Where appropriate, interpret simple expressions as functions with inputs and outputs; interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function' (the use of formal function notation is expected).	Y7 - T2, Y8 - T3.
A8	Work with coordinates in all four quadrants.	Y7 - T6.
A9	Plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form $y = mx + c$ to identify parallel and perpendicular lines; find the equation of the line through two given points or through one point with a given gradient.	Y7 - T6, Y8 - T6.
A10	Identify and interpret gradients and intercepts of linear functions graphically and algebraically.	Y8 - T4, T6.
A11	Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically and turning points by completing the square.	KS4 Topic
A12	Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = 1/x$ with $x \neq 0$ , exponential functions $y = k^x$ for positive values of $k$ , and the trigonometric functions (with arguments in degrees) $y = \sin x$ , $y = \cos x$ , $y = \tan x$ for angles of any size.	KS4 Topic
A13	Sketch translations and reflections of a given function	KS4 Topic
A14	Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration	Y8 - T4.
A15	Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts (this does not include calculus)	KS4 Topic
A16	Recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point	KS4 Topic
A17	Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph	Y8 - T3.
A18	Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula; find approximate solutions using a graph	KS4 Topic

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A19	Solve two simultaneous equations in two variables (linear/linear or linear/quadratic) algebraically; find approximate solutions using a graph	KS4 Topic
A20	Find approximate solutions to equations numerically using iteration	KS4 Topic
A21	Translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution	KS4 Topic
A22	Solve linear inequalities in one or two variable(s), and quadratic inequalities in one variable; represent the solution set on a number line, using set notation and on a graph	KS4 Topic
A23	Generate terms of a sequence from either a term-to-term or a position-to-term rule	Y7 - T6.
A24	Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions ( $r^n$ where $n$ is an integer, and $r$ is a rational number $> 0$ or a surd) and other sequences	Y7 - T6.
A25	Deduce expressions to calculate the $n$ th term of linear and quadratic sequences.	Y7 - T6.

Code	The National Curriculum Statement from EDEXCEL Specification for GCSE (9-1) Mathematics	KTC reference to the National Curriculum
	Ratio and Proportion:	
R1	Change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts	Y7 - T3.
R2	Use scale factors, scale diagrams and maps	Y7 - T3.
R3	Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1	Y7 - T3, T5.
R4	Use ratio notation, including reduction to simplest form	Y7 - T5.
R5	Divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)	Y7 - T5, Y8 - T4.
R6	Express a multiplicative relationship between two quantities as a ratio or a fraction	KS4 Topic
R7	Understand and use proportion as equality of ratios	Y7 - T5.

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R8	Relate ratios to fractions and to linear functions	Y7 - T5.
R9	Define percentage as 'number of parts per hundred'; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics	Y7 - T4, Y8 - T7.
R10	Solve problems involving direct and inverse proportion, including graphical and algebraic representations	Y8 - T6.
R11	Use compound units such as speed, rates of pay, unit pricing, density and pressure	Y8 - T6.
R12	Compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors	KS4 Topic
R13	Understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y; construct and interpret equations that describe direct and inverse proportion	KS4 Topic
R14	Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion	Y8 - T6.
R15	Interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts (this does not include calculus)	KS4 Topic
R16	Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes	KS4 Topic

<b>Code</b>	<b>The National Curriculum Statement from EDEXCEL Specification for GCSE (9-1) Mathematics  Geometry:</b>	<b>KTC reference to the National Curriculum</b>
G1	Use conventional terms and notation: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description	Y7 - T6.
G2	Use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line	KS4 Topic
G3	Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles; understand and use alternate and corresponding angles on parallel lines; derive and use the sum of angles in a triangle (e.g. to deduce and	Y7 - T6, Y8 - T5.

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	use the angle sum in any polygon, and to derive properties of regular polygons)	
G4	Derive and apply the properties and definitions of special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language	Y7 - T6, Y8 - T5.
G5	Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)	Y7 - T7.
G6	Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs	KS4 Topic
G7	Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors)	Y7 - T7.
G8	Describe the changes and invariance achieved by combinations of rotations, reflections and translations	Y7 - T7.
G9	Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	KS4 Topic
G10	Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results	KS4 Topic
G11	Solve geometrical problems on coordinate axes	KS4 Topic
G12	Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres	Y8 - T2.
G13	Construct and interpret plans and elevations of 3D shapes	Y8 - T2.
G14	Use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)	Y7 - T3, Y8 - T2.
G15	Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings	Y7 - T3, T6.
G16	Know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)	Y8 - T2.
G17	Know the formulae: circumference of a circle = $2\pi r = \pi d$ , area of a circle = $\pi r^2$ ; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes; surface area and volume of spheres, pyramids, cones and composite solids	KS4 Topic
G18	Calculate arc lengths, angles and areas of sectors of circles	KS4 Topic
G19	Apply the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures	KS4 Topic
G20	Know the formulae for: Pythagoras' theorem $a^2 + b^2 = c^2$ , and the trigonometric ratios, $\sin \theta = \text{opposite/hypotenuse}$ , $\cos \theta = \text{adjacent/hypotenuse}$ and $\tan \theta = \text{opposite/adjacent}$ apply them to find angles and lengths in right-angled triangles and, where possible, general triangles in two and three dimensional figures	KS4 Topic
G21	Know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and $90^\circ$ ; know the exact value of $\tan \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and $60^\circ$	KS4 Topic

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G22	Know and apply the sine rule $a/\sin A = b/\sin B = c/\sin C$ , and cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$ , to find unknown lengths and angles	KS4 Topic
G23	Know and apply $\text{Area} = 1/2 ab \sin C$ to calculate the area, sides or angles of any triangle	KS4 Topic
G24	Describe translations as 2D vectors	KS4 Topic
G25	Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; use vectors to construct geometric arguments and proofs	KS4 Topic

Code	The National Curriculum Statement from EDEXCEL Specification for GCSE (9-1) Mathematics	KTC reference to the National Curriculum
	Probability:	
P1	Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees	
P2	Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments	Y7 - T4.
P3	Relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale	Y7 - T4.
P4	Apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one	Y7 - T4.
P5	Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size	KS4 Topic
P6	Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams	KS4 Topic
P7	Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities	KS4 Topic
P8	Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions	KS4 Topic
P9	Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams	KS4 Topic

Code	The National Curriculum	KTC
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	Statement from EDEXCEL Specification for GCSE (9-1) Mathematics	reference to the National Curriculum
	<b>Statistics:</b>	
S1	Infer properties of populations or distributions from a sample, while knowing the limitations of sampling	
S2	Interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use	Y7 - T2, Y8 - T3.
S3	Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use	
S4	"Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: <ul style="list-style-type: none"> <li>• Appropriate graphical representation involving discrete, continuous and grouped data, including box plots</li> <li>• Appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, quartiles and inter-quartile range)"</li> </ul>	Y7 - T2, Y8 - T3.
S5	Apply statistics to describe a population	Y8 - T3.
S6	Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends while knowing the dangers of so doing	Y8 - T3.