ICKNIELD HIGH SCHOOL KEY STAGE 4 CURRICULUM MAP

'Raising the Achievement of All'

WELL-SEQUENCED **CONTEXUALISED/INCLUSIVE** **AMBITIOUS**

SUBJECT: Maths **Year: 10**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Key Questions	**Foundation Unit 1:** Can you use BIDMAS with more than 3 operations, including powers and roots? Can you solve problems using LCM? **Foundation Unit 2:** Can you add like terms when the variables have power? Can you substitute negative numbers into expressions with roots and powers? Can you expand two single brackets that contain negative terms? **Foundation Unit 3:** Can you find averages from a table? Can you deal with changes to a mean when a group of values change? **Foundation Unit 4:** Can you convert between simple fractions and decimals, i.e. 10%, 3/4 and 0.3? Can you compare different test scores that are recorder in percentages or fractions? **Higher Unit 1:** Can you calculate the final value of an investment after a number of years when the interest rate changes during the period? Can you deal with density problems when mixing different elements? **Higher Unit 2:** Can you enlarge a shape by a negative scale factor? Can you deal with invariant points? **Higher Unit 3:** Can you simply fy a fractions that has both negative and fractional indices?	**Foundation Unit 1:** Can you perform the four operations on fractions and mixed numbers? Can you calculate a percentage of a quantity? Can you calculate population growth? **Foundation Unit 2:** Can you distinguish between alternate, corresponding and co-interior angles and use these key words when doing simple proofs? **Foundation Unit 3:** Can you solve equations with fractions and decimals, or with variables on both sides? Can you form an equation from a geometrical problem? (i.e. perimeter or area). Can you solve a double ended inequality and show the solutions as a number line? **Higher Unit 1:** Can you calculate averages from frequency tables? Can you estimate the size of a population using the capture/recapture method? Can you estimate the mean from a frequency polygon? **Higher Unit 2:** Can you solve a quadratic equation by: Factorising? Completing the square? Using the quadratic formula? Can you form and solve a quadratic equation from a given context? **Higher Unit 3:**	**Foundation Unit 1:** Can you calculate the perimeter of basic shapes including compound shapes? Can you calculate the area of rectangles, triangles, trapezia and calculate missing lengths given their areas? Can you calculate the volumes of prisms and other 3D shapes such as cones, spheres and pyramids? **Foundation Unit 2:** Can you distinguish between continuous and discrete data and design suitable charts to represent them? Can you draw your own two-way table given some quantitative information? **Foundation Unit 3:** Can you distinguish between a linear and quadratic sequence? Can you apply a Fibonacci sequence to a sequence with algebraic terms? Can you calculate the nth term of a linear sequence? **Higher Unit 1:** Can you identify the equation of from a linear graph? Can you identify the equation of a linear graph given two coordinates? Can you determine the equation of parallel and perpendicular graphs? **Higher Unit 2:** Can you identify the information required to use the sine and	**Foundation Unit 1:** Can you calculate the gradient from a graph or from two coordinates? Can you draw a linear graph? **Foundation Unit 2:** Can you draw and interpret a conversion graph? Can you draw a distance – time graph for a journey? Can you calculate the speed from a distance-time graph? **Foundation Unit 3:** Can you perform transformations? Can you describe transformations using the correct features? **Higher Unit 1:** Can you solve double ended inequalities? Can you describe and draw inequalities on a number line? Can you identify regions on a graph using inequalities? **Higher Unit 2:** Can you rearrange formulae when the subject appears twice? Can you prove that recurring decimals are rational numbers? Can you simplify algebraic fractions? Can you use algebraic fractions to solve equations? **Higher Unit 3:** Can you identify a geometric progression? Can you find the nth term of a quadratic sequence?	**Foundation Unit 1:** Can you share a quantity into a given ratio with two and three parts? Can you solve multi-step ratio problems? **Foundation Unit 2:** Can you calculate items that are best value for money? Can you solve recipe problems involving scaling? **Higher Unit 1:** Can you find the solutions to simultaneous equations where one of the equations are non-linear? Can you set up equations when relationships are directly and inversely proportional? **Higher Unit 2:** Can you sketch a quadratic highlighting the axes intercepts and turning points? Can you find the solution to a quadratic and linear inequality? **Higher Unit 3:** Can you apply the product rule for counting in different contexts? Do you understand how to apply the product rule for counting when finding different pairs within a group? **Higher unit 4** Can you identify the length scale factors from area scale factors? Can you identify the area scale factor from the volume scale factor?	**Foundation Unit 1:** Can you draw the elevations of basic shapes? Can you draw elevations where the viewpoint is a slanted face? **Foundation Unit 2:** Can you construct an angle bisector and perpendicular bisector? Can you apply bisectors to real-life contexts? Can you apply bearings to loci problems? **Higher Unit 1** Can you find an error interval for values rounded to the nearest 10, 100 or 1 d.p? Can you find the error interval when values are rounded to significant figures? Can you calculate the upper and lower bounds for different calculations that involve addition and multiplication? Can you calculate the upper and lower bounds for different calculations that involve subtraction and division? Can you apply bounds to real life contexts? **Higher Unit 2:** Can you calculate the area under a velocity time graph? DO you understand how to calculate the distance travelled from a velocity-time graph? Can you calculate the velocity from a distance time graph? Can you calculate an estimate of the acceleration from a velocity time graph?

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	Can you simplify a multiple of a surd? Can you rationalise surds with two terms in the numerator and denominator? **Higher Unit 4:** Can you recall exact values? Can you use skills developed with surds to add, subtract, multiply and divide exact values?	Can you calculate the angle of a sector given its radius and area or arc length? Can you calculate the radius of a sector given its angle and sector area of arc length? **Higher Unit 4:** Can you identify the cross section of a prism? Can you calculate the missing length of a prism given its surface area of volume? Can you calculate missing lengths within spheres, cones and pyramid given their volumes?	cosine rules when calculating missing lengths or angles? Can you use the sine and cosine rules several times to solve a multi-step problem? Can you use the sine rule to calculate the area of a triangle> **Higher Unit 3:** Can you draw a boxplot, cumulative frequency graph and histogram? Can you interpret a boxplot? Can you calculate quartiles from a cumulative frequency graph? Can you interpret a histogram or even calculate the mean and median from it?			
Content: 'Know what'	**Foundation Topic:** 1. Number: powers, decimals, LCM, HCF, rounding, BIDMAS 2. Algebra: Like terms & expressions, substitution, expanding brackets, factorising. 3. Data: Averages 4. Fractions, Decimals, Percentages. **Higher Topic:** 1. Multiplicative Reasoning: compound growth & decay, pressure, density and speed 2. Transformations: reflections, rotations, translations, enlargements including negative scale factors. 3. Surds: Simplifying, expanding brackets, rationalising the denominator, fractional indices 4. Trig: RECAP right-angle trigonometry, exact values	**Foundation Topic:** 1. Fractions & Percentages: adding & subtracting fractions & mixed numbers, percentages multipliers, simple interest 2. Angles: alternate, corresponding, co-interior angles, angles in polygons 3. Equations & inequalities: Inequalities on a number line, solving equations. **Higher Topic:** 1. Data: Sampling, averages from a table, combined mean, frequency polygons 2. Solve Quadratic Equations: solve by factorising, quadratic formula, complete the square. 3. Sectors of a Circle, arc length of a sector, sector area 4. Volume & surface area of 3D shapes including prisms, cones, spheres and pyramids	**Foundation Topic:** 1. Perimeter, Area & Volume: area of rectangles, triangles, trapezium, compound shapes, volume of cylinders, prisms. 2. Graphs and charts: Draw & interpret pie charts, scatter graphs, two-way tables. 3. Sequences: Term to term rule, nth term of a sequence, Fibonacci sequences **Higher Topic:** 1. Graphs of Parallel & Perpendicular Lines: y=mx+c, gradients of parallel & perpendicular lines. 2. Trigonometric rules and graphs - sine rule (including the ambiguous case), cosine rule, sine rule for area of a triangle, draw trigonometric graphs 3. Data: Draw and interpret: histograms, cumulative frequency graphs and boxplots	**Foundation Topic**: 1. Linear Graphs: y=mx+c, gradients, plotting linear graphs, finding the equation of a graph. 2. Real Life Graphs: conversion graphs, distance – time graphs 3. Transformations: rotation, reflection, translation, enlargements, describing transformations. **Higher Topic:** 1. Inequalities & Regions: solve linear inequalities, shade region that satisfies one or more inequalities. 2. Rearrange formulae, Algebraic fractions, recurring decimal proof, algebraic fractions 3. Geometric & quadratic sequences	**Foundation Topic:** 1. Ratio: simplifying ratios, sharing into a given quantity, solving problems with ratios. 2. Proportion: value for money problems, recipe problems. **Higher Topics:** 1. Direct & Inverse Proportion, Simultaneous Equations (non-linear) 2. Sketching graphs, quadratic inequalities, Iteration 3. Product rule for counting 4. Area & volume scale factors	**Foundation Topic:** 1. Plans & Elevations 2. Constructions, Bearings & Loci: Construct angle and perpendicular bisector, use bisectors to solve loci problems, measure and calculate bearings. **Higher Topic:** 1. Upper & Lower Bounds 2. Area under a graph and rates of change
Expertise: 'Know how'	• Simplifying fractions • Ordering Fractions • Equivalent Fractions • Understand the properties of simple 3D shapes	• Angle facts • Measure and draw angles • Substitution • Rearranging formulae • Fraction/ percentage of a quantity	• Calculate averages • Solve linear simultaneous equations • Sorting data • Expand single brackets	• Angle facts including angles in parallel lines • Measuring lines and angles • Scale drawings • Multiply double brackets • Draw Linear graphs	• Using a table of values to draw graphs • Fractions of a quantity • Solve simultaneous equations algebraically • Formulae – substitution	• Ratio • Percentages • Averages • Formulae • Calculate with fractions, decimals, percentage

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	• Percentage, fraction, decimal equivalences • Fraction of a quantity • Simplifying ratios • Solve linear equations • Solve quadratic equations	• Fractions, percentage equivalences • Powers/ roots • Solving linear equations • Drawing the equation of a linear graph • Properties of 2D shapes • Convert between units of length • Label lengths and angles that are equal	• Factorise simple linear expressions • Exact trigonometric values • Simplify surds • Rationalise the denominator • Area & circumference of a circle • Use Trig. Ratios to solve problems in right-angle triangles	• Find the equation of a linear graph • Function machine	• Formulae – Rearranging	• Identify equivalent fractions, decimals, percentage • Understand that the probability of all events have a sum of 1 • Angles in equilateral and isosceles triangle • Identify the parts of a circle
Literacy/ Numeracy/ SMSC/	To use the correct Mathematical terminology to describe transformation. To understand that the concept of probability is used in the wider world to calculate risk, affecting interest rates, prices of commodities etc. Understand that percentages are used commonly in the media to help us understand matters but can also be misleading and affect public opinion.	To be able to appreciate that the use of compasses is every day practice of professionals such as architects. Understand that scale models are used to showcase and sell a range of products from planes and buildings to large infrastructure projects. To be able to appreciate the use of skills learnt in ratio/proportion unit are transferable across many subject areas including Food Tech, Design & Technology, Business Studies, Science etc.	To be able to articulate an understanding of which is the most suitable average and why? To be able to explain why some averages may be used to skew perception of data. May relate to latest findings such as data used for COVID. Appreciate why the design of scale on axes can give a distorted view about real -world information, i.e. rise in unemployment, inflation etc. To be able to understand that large pieces of data can be used to make predictions (general elections/ insurance industry) – the more accurate the data, the better the prediction.	To be able to interpret histograms and relate to real scenarios. To be able to understand that lines/curves seen in real life objects are accurately drawn using equations, for example large structures like the Gherkin. To be able to use the skills of substituting into, and rearranging a formula across other subjects, i.e. Science.	To be able to appreciate that concepts around 2D space (area) are vital to the production of food, for example, applying too much fertiliser to an area can have disastrous consequences for crop productions. Understand that freight costs are determined by volume and since fuel has become more expensive, so has the cost transporting aid to developing countries.	To be able to understand that constructions can be used accurately draw diagrams for the purpose of design of large and intricate buildings, bridges, paintings etc.
Careers	ALGEBRA real life applications: creating formulae, predicting costs, programming algorithms, modelling populations or profits) leading to following careers: Engineer, software developer, data analyst, economist, accountant, scientist FRACTIONS real life applications: Measuring ingredients, calculating medication doses, cutting materials accurately, scaling recipes and plans leading to the following careers: Chef, pharmacist, nurse, carpenter, electrician, tailor	PERCENTAGES real life applications: Calculating discounts, VAT, profit margins, pay rises, interest rates, medication concentrations, survey results and business performance leading to the following careers: Accountant, retail manager, financial adviser, nurse, pharmacist, data analyst, marketer. ANGLES real life applications, designing buildings, installing roofs, laying pipes and cables, navigation, manufacturing, creating technical drawings leading to following careers: Architect, carpenter,	GRAPHS & CHARTS real life applications: Presenting trends, analysing sales, tracking patient recovery, interpreting scientific results, reporting statistics and making evidence-based decisions leading to the following careers: Data analyst, business manager, scientist, journalist, economist, healthcare professional, environmental scientist. SEQUENCES real life applications: Writing algorithms, predicting patterns, forecasting investments, coding repetitive processes, modelling population growth and	TRANSFORMATIONS real life applications: Rotating machine parts, reflecting designs for symmetry, scaling drawings, moving objects in computer graphics, creating maps and blueprints leading to the following careers: Architect, graphic designer, CAD technician, game developer, engineer, surveyor, animator INEQUALITIES real life applications: Working within limits such as budgets, safety thresholds, weight limits, production capacities, or	RATIO & PROPORTION real life application: Scaling recipes, mixing paint or concrete, medication dosages, map reading, fuel mixtures, currency exchange, financial budgeting leading to the following careers: Chef, Pharmacist, Nurse, Architect, Engineer, Financial Adviser, Builder, Fashion Designer QUADRATIC GRAPHS real life applications: Designing bridges and arches, calculating projectile motion in sports, planning roller coasters, satellite trajectories, camera lenses, computer	PLANS & ELEVATIONS real life applications Reading architectural blueprints, designing furniture, creating video game environments, manufacturing products, planning buildings leading to the following careers: Architect, Civil Engineer, Interior Designer, CAD Technician, Product Designer, Construction Manager CONSTRUCTIONS & BEARINGS real life applications: Navigation by ships and aircraft, land surveying, setting out roads and buildings, mapping, military navigation, drone flight planning leading to the

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	AVERAGES real life applications: Analysing performance, exam results, customer satisfaction, patient recovery, business trends leading to the following careers: Sports analyst, market researcher, teacher, healthcare professional, business manager COMPOUND MEASURES real life applications: Calculating travel times, selecting building materials, fuel efficiency, transporting goods, designing vehicles leading to the following careers: Civil engineer, pilot, logistics manager, physicist, construction worker, materials scientist. TRIGONOMETRY real life applications: Measuring inaccessible heights, designing roofs and bridges, navigation, satellite positioning, mapping land leading to following careers: Surveyor, architect, engineer, astronomer, pilot, drone operator, construction manager	electrician, engineer, surveyor, pilot, graphic designer QUADRATIC EQUATIONS real life applications: Modelling projectile motion, bridge design, vehicle suspension, animation, satellite trajectories and optimisation problems leading to the following careers: Mechanical engineer, aerospace engineer, game developer, physicist, architect, computer graphics programmer VOLUME & SURFACE AREA real life applications: Estimating materials, designing packaging, calculating paint needed, determining storage capacity, mixing concrete, designing containers leading to the following careers: Civil engineer, packaging designer, architect, construction manager, chef, warehouse manager, product designer	machine learning leading to the following careers: Computer programmer, financial analyst, engineer, musician, cryptographer, AI developer STRAIGHT LINE GRAPHS real life applications: Creating accurate technical drawings, designing road layouts, planning buildings, ensuring structures are aligned and meet safety specifications leading to the following careers: Architect, civil engineer, surveyor, CAD technician, town planner, interior designer HISTOGRAM/ CUMULATIVE FREQUNCY real life applications: Analysing large datasets, identifying trends, measuring performance, monitoring product quality, interpreting experimental results and understanding distributions leading to following careers: Statistician, medical researcher, quality assurance inspector, psychologist, sports scientist, manufacturing engineer	environmental regulations leading to the following careers: Financial analyst, operations manager, engineer, scientist, logistics planner, data analyst. ALGEBRAIC FRACTIONS real life applications Simplifying formulas, modelling relationships between variables, calculating rates, efficiencies, probabilities, and electrical circuits leading to the following careers: Engineer, physicist, chemist, economist, software developer, statistician.	animation leading to the following careers: Engineer, Game Developer, Data Scientist, Physicist, Architect, Robotics Engineer AREA & VOLUME SCALE FACTORS real life applications: Estimating paint needed for houses, scaling 3D-printed models, designing water tanks, calculating packaging sizes, construction planning, medical imaging leading to the following careers: Architect, Construction Manager, Surveyor, Industrial Designer, Mechanical Engineer, 3D Modeller PRODUCT RULE FOR COUNTING real life applications: Calculating password combinations, planning tournament fixtures, designing product options, genetics (possible offspring combinations), quality testing, encryption leading to the following careers: Computer Scientist, Cybersecurity Analyst, Statistician, Data Scientist, Geneticist, Operations Planner	following careers: Surveyor, Pilot, Civil Engineer, Architect, Cartographer, Naval Officer UPPER & LOWER BOUNDS real life applications Manufacturing parts within safety limits, engineering quality control, estimating construction materials, scientific experiments, pharmaceutical production leading to the following careers: Mechanical Engineer, Manufacturing Engineer, Surveyor, Quality Control Inspector, Laboratory Technician, Pharmacist AREA UNDER A GRAPH & RATES OF CHANGE real life applications: Calculating total distance travelled from speed-time graphs, measuring water or fuel usage over time, electricity consumption, analysing medical data, economics, Monitoring population growth, predicting disease spread, analysing stock market trends, calculating acceleration, monitoring business performance, climate modelling leading to the following careers Mechanical Engineer, Physicist, Data Analyst, Economist, Transport Planner, Environmental Scientist, Financial Analyst