Term	Topic	Learning Outcomes	Assessment
Year 9 Term 1	Unit 1: Calculations and Accuracy	• Add, subtract, multiply and divide decimals, whole numbers including any number between 0 and 1; • Put digits in the correct place in a decimal calculation and use one calculation to find the answer to another; • Use the 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 $m \times n$ ways); • Round numbers to the nearest 10, 100, 1000, the nearest integer, to a given number of decimal places and to a given number of significant figures; • Estimate answers to one- or two-step calculations, including use of rounding numbers and formal estimation to 1 significant figure: mainly whole numbers and then decimals. •	
	Unit 1: Indices, Roots and Reciprocals	• Use index notation for integer powers of 10, including negative powers; • Recognise powers of 2, 3, 4, 5; • Use the square, cube and power keys on a calculator and estimate powers and roots of any given positive number, by considering the values it must lie between, e.g. the square root of 42 must be between 6 and 7; • Find the value of calculations using indices including positive, fractional and negative indices; • Recall that $n^0 = 1$ and $n^{-1} = \dfrac{1}{n}$ for positive integers n as well as, $n^{\frac{1}{2}} = \sqrt{n}$ and $n^{\frac{1}{3}} = \sqrt[3]{n}$ for any positive number n; • Understand that the inverse operation of raising a positive number to a power n is raising the result of this operation to the power $\dfrac{1}{n}$; • Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractional and negative powers, and powers of a power;	

	• Solve problems using index laws; • Use brackets and the hierarchy of operations up to and including with powers and roots inside the brackets, or raising brackets to powers or taking roots of brackets; • Use an extended range of calculator functions, including +, −, ×, ÷, x^2, $\sqrt{x}$, memory, x^y, $x^{\frac{1}{y}}$, brackets; • Use calculators for all calculations: positive and negative numbers, brackets, powers and roots, four operations. •	
Unit 1: Primes, Standard Form and Surds	• Identify factors, multiples and prime numbers; • Find the prime factor decomposition of positive integers – write as a product using index notation; • Find common factors and common multiples of two numbers; • Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors – include finding LCM and HCF given the prime factorisation of two numbers; • Solve problems using HCF and LCM, and prime numbers; • Understand that the prime factor decomposition of a positive integer is unique, whichever factor pair you start with, and that every number can be written as a product of prime factors; • Convert large and small numbers into standard form and vice versa; • Add, subtract, multiply and divide numbers in standard form; • Interpret a calculator display using standard form and know how to enter numbers in standard form; • Understand surd notation, e.g. calculator gives answer to sq rt 8 as 4 rt 2; • Simplify surd expressions involving squares (e.g. $\sqrt{12}$ = $\sqrt{(4 \times 3)}$ = $\sqrt{4} \times \sqrt{3}$ = $2\sqrt{3}$). •	End of Unit Test

Unit 3: Algebra - The Basics

- Use algebraic notation and symbols correctly;
- Know the difference between a term, expression, equation, formula and an identity;
- Write and manipulate an expression by collecting like terms;
- Substitute positive and negative numbers into expressions such as $3x + 4$ and $2x^3$ and then into expressions involving brackets and powers;
- Substitute numbers into formulae from mathematics and other subject using simple linear formulae, e.g. $l \times w$, $v = u + at$;
- Simplify expressions by cancelling, e.g. $\dfrac{4x}{2} = 2x$;
- Use instances of index laws for positive integer powers including when multiplying or dividing algebraic terms;
- Use instances of index laws, including use of zero, fractional and negative powers;
- Multiply a single term over a bracket and recognise factors of algebraic terms involving single brackets and simplify expressions by factorising, including subsequently collecting like terms;
- Expand the product of two linear expressions, i.e. double brackets working up to negatives in both brackets and also similar to $(2x + 3y)(3x - y)$;
- Know that squaring a linear expression is the same as expanding double brackets;
- Factorise quadratic expressions of the form $ax^2 + bx + c$;
- Factorise quadratic expressions using the difference of two squares;
- Set up simple equations from word problems and derive simple formulae;
- Understand the $\neq$ symbol (not equal), e.g. $6x + 4 \neq 3(x + 2)$, and introduce identity $\equiv$ sign;
- Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation;
- Solve linear equations which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;
- Solve linear equations in one unknown, with integer or fractional coefficients;
- Set up and solve linear equations to solve to solve a problem;
- Derive a formula and set up simple equations from word problems, then solve these equations, interpreting the solution in the context of the problem;
- Substitute positive and negative numbers into a formula, solve the resulting equation including brackets, powers or standard form;
- Use and substitute formulae from mathematics and other subjects, including the kinematics formulae $v = u + at$, $v^2 - u^2 = 2as$, and $s = ut + \dfrac{1}{2} at^2$;
- Change the subject of a simple formula, i.e. linear one-step, such as $x = 4y$;
- Change the subject of a formula, including cases where the subject is on both sides of the original formula, or involving fractions and small powers of the subject;
- Simple proofs and use of $\equiv$ in "show that" style questions; know the difference between an equation and an identity;

		• Use iteration to find approximate solutions to equations, for simple equations in the first instance, then quadratic		
	Unit 3: Algebra - Sequences	• Recognise simple sequences including at the most basic level odd, even, triangular, square and cube numbers and Fibonacci-type sequences; • Generate sequences of numbers, squared integers and sequences derived from diagrams; • Describe in words a term-to-term sequence and identify which terms cannot be in a sequence; • Generate specific terms in a sequence using the position-to-term rule and term-to-term rule; • Find and use (to generate terms) the nth term of an arithmetic sequence; • Use the nth term of an arithmetic sequence to decide if a given number is a term in the sequence, or find the first term above or below a given number; • Identify which terms cannot be in a sequence by finding the nth term; • Continue a quadratic sequence and use the nth term to generate terms; • Find the nth term of quadratic sequences; • Distinguish between arithmetic and geometric sequences; • Use finite/infinite and ascending/descending to describe sequences; • Recognise and use simple geometric progressions (rn where n is an integer, and r is a rational number > 0 or a surd); • Continue geometric progression and find term to term rule, including negative, fraction and decimal terms; • Solve problems involving sequences from real life situations.	End of Unit Test	

		Unit		

		Unit 3: Averages	• Design and use two-way tables for discrete and grouped data;
			• Use information provided to complete a two-way table;
			• Sort, classify and tabulate data and discrete or continuous quantitative data;
			• Calculate mean and range, find median and mode from a small data set;
			• Use a spreadsheet to calculate mean and range, and find median and mode;
			• Recognise the advantages and disadvantages between measures of average;
			• Construct and interpret stem and leaf diagrams (including back-to-back diagrams):
			  • find the mode, median, range, as well as the greatest and least values from stem and leaf diagrams, and compare two distributions from stem and leaf diagrams (mode, median, range);
			• Calculate the mean, mode, median and range from a frequency table (discrete data);
			• Construct and interpret grouped frequency tables for continuous data:
			  • for grouped data, find the interval which contains the median and the modal class;
			  • estimate the mean with grouped data;
			  • understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values.
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		Unit 4: Representing and Interpreting Data	• Know which charts to use for different types of data sets; • Produce and interpret composite bar charts; • Produce and interpret comparative and dual bar charts; • Produce and interpret pie charts: • find the mode and the frequency represented by each sector; • compare data from pie charts that represent different-sized samples; • Produce and interpret frequency polygons for grouped	End of Unit Test

data:

- from frequency polygons, read off frequency values, compare distributions, calculate total population, mean, estimate greatest and least possible values (and range);
- Produce frequency diagrams for grouped discrete data:
- read off frequency values, calculate total population, find greatest and least values;
- Produce histograms with equal class intervals:
- estimate the median from a histogram with equal class width or any other information, such as the number of people in a given interval;
- Produce line graphs:
- read off frequency values, calculate total population, find greatest and least values;
- Construct and interpret time–series graphs, comment on trends;
- Compare the mean and range of two distributions, or median or mode as appropriate;
- Recognise simple patterns, characteristics relationships in bar charts, line graphs and frequency polygons;
- Draw and interpret scatter graphs in terms of the relationship between two variables;
- Draw lines of best fit by eye, understanding what these represent;
- Identify outliers and ignore them on scatter graphs;
- Use a line of best fit, or otherwise, to predict values of a variable given values of the other variable;
- Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem;
- Understand that correlation does not imply causality, and appreciate that correlation is a measure of the strength of the association between two variables and that zero correlation does not necessarily imply 'no relationship' but merely 'no linear correlation';
- Explain an isolated point on a scatter graph;
- Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.
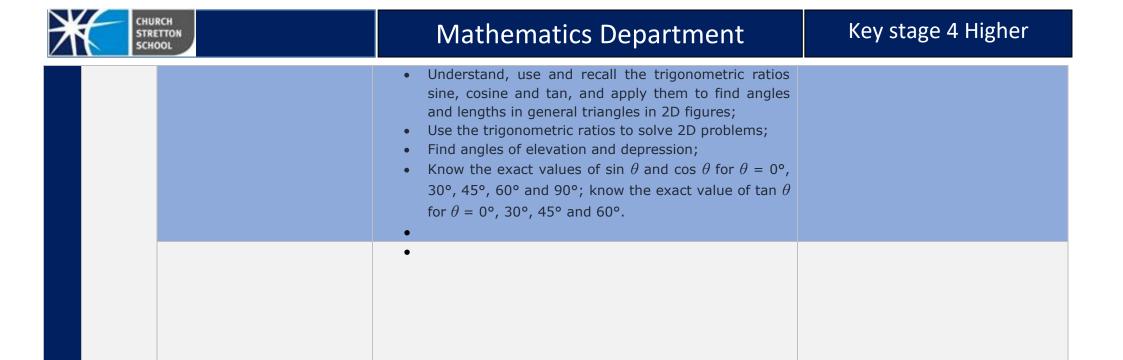
Term	Topic	Learning Outcomes	Assessment
Year 9 Term 2	Unit 4: Number: Fractions and Percentages	• Express a given number as a fraction of another; • Find equivalent fractions and compare the size of fractions; • Write a fraction in its simplest form, including using it to simplify a calculation, e.g. $50 \div 20 = \dfrac{50}{20} = \dfrac{5}{2} = 2.5$; • Find a fraction of a quantity or measurement, including within a context; • Convert a fraction to a decimal to make a calculation easier; • Convert between mixed numbers and improper fractions; • Add and subtract fractions, including mixed numbers; • Multiply and divide fractions, including mixed numbers and whole numbers and vice versa; • Understand and use unit fractions as multiplicative inverses; • By writing the denominator in terms of its prime factors, decide whether fractions can be converted to recurring or terminating decimals; • Convert a fraction to a recurring decimal and vice versa; • Find the reciprocal of an integer, decimal or fraction; • Convert between fractions, decimals and percentages; • Express a given number as a percentage of another number; • Express one quantity as a percentage of another where the percentage is greater than 100% • Find a percentage of a quantity; • Find the new amount after a percentage increase or decrease; • Work out a percentage increase or decrease, including: simple interest, income tax calculations, value of profit or loss, percentage profit or loss; • Compare two quantities using percentages, including a range of calculations and contexts such as those involving time or money; • Find a percentage of a quantity using a multiplier and use a multiplier to increase or decrease by a percentage in any scenario where percentages are used; • Find the original amount given the final amount after a percentage increase or decrease (reverse percentages), including VAT; • Use calculators for reverse percentage calculations by doing an appropriate division; • Use percentages in real-life situations, including percentages greater than 100%; • Describe percentage increase/decrease with fractions, e.g. 150%	

	increase means $2\frac{1}{2}$ times as big; • Understand that fractions are more accurate in calculations than rounded percentage or decimal equivalents, and choose fractions, decimals or percentages appropriately for calculations. •	
Unit 4: Ratio and Proportion	• Express the division of a quantity into a number parts as a ratio; • Write ratios in form $1 : m$ or $m : 1$ and to describe a situation; • Write ratios in their simplest form, including three-part ratios; • Divide a given quantity into two or more parts in a given part : part or part : whole ratio; • Use a ratio to find one quantity when the other is known; • Write a ratio as a fraction and as a linear function; • Identify direct proportion from a table of values, by comparing ratios of values; • Use a ratio to compare a scale model to real-life object; • Use a ratio to convert between measures and currencies, e.g. £1.00 = €1.36; • Scale up recipes; • Convert between currencies	End of Unit Test
Unit 5: Polygons, Angles and Parallel Lines	• Classify quadrilaterals by their geometric properties and distinguish between scalene, isosceles and equilateral triangles; • Understand 'regular' and 'irregular' as applied to polygons; • Understand the proof that the angle sum of a triangle is 180°, and derive and use the sum of angles in a triangle; • Use symmetry property of an isosceles triangle to show that base angles are equal; • Find missing angles in a triangle using the angle sum in a triangle AND the properties of an isosceles triangle; • Understand a proof of, and use the fact that, the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices; • Explain why the angle sum of a quadrilateral is 360°; use the angle properties of quadrilaterals and the fact that the angle sum of a quadrilateral is 360°;	

- Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding and alternate angles, giving reasons;
- Use the angle sums of irregular polygons;
- Calculate and use the sums of the interior angles of polygons, use the sum of angles in a triangle to deduce and use the angle sum in any polygon and to derive the properties of regular polygons;
- Use the sum of the exterior angles of any polygon is 360°;
- Use the sum of the interior angles of an n-sided polygon;
- Use the sum of the interior angle and the exterior angle is 180°;
- Find the size of each interior angle, or the size of each exterior angle, or the number of sides of a regular polygon, and use the sum of angles of irregular polygons;
- Calculate the angles of regular polygons and use these to solve problems;
- Use the side/angle properties of compound shapes made up of triangles, lines and quadrilaterals, including solving angle and symmetry problems for shapes in the first quadrant, more complex problems and using algebra;
- Use angle facts to demonstrate how shapes would 'fit together', and work out interior angles of shapes in a pattern.

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Unit 5: Pythagoras and Trigonometry

- Understand, recall and use Pythagoras' Theorem in 2D;
- Given three sides of a triangle, justify if it is right-angled or not;
- Calculate the length of the hypotenuse in a right-angled triangle (including decimal lengths and a range of units);
- Find the length of a shorter side in a right-angled triangle;
- Calculate the length of a line segment AB given pairs of points;
- Give an answer to the use of Pythagoras' Theorem in surd form;

		• Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures; • Use the trigonometric ratios to solve 2D problems; • Find angles of elevation and depression; • Know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0°$, 30°, 45°, 60° and 90°; know the exact value of $\tan \theta$ for $\theta = 0°$, 30°, 45° and 60°. • •	

Term	Topic	Learning Outcomes	Assessment
Year 9	Unit 6: Graphs - The Basics	• Identify and plot points in all four quadrants; • Draw and interpret straight-line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills, fixed charge and cost per item; • Draw distance–time and velocity–time graphs; • Use graphs to calculate various measures (of individual sections), including: unit price (gradient), average speed, distance, time, acceleration; including using enclosed areas by counting squares or using areas of trapezia, rectangles and triangles; • Find the coordinates of the midpoint of a line segment with a diagram given and coordinates; • Find the coordinates of the midpoint of a line segment from coordinates; • Calculate the length of a line segment given the	

Term 3		coordinates of the end points; • Find the coordinates of points identified by geometrical information. • Find the equation of the line through two given points.	
	Unit 6: Co-ordinate Geometry	• Plot and draw graphs of $y = a$, $x = a$, $y = x$ and $y = -x$, drawing and recognising lines parallel to axes, plus $y = x$ and $y = -x$; • Identify and interpret the gradient of a line segment; • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane; • Identify and interpret the gradient and y-intercept of a linear graph given by equations of the form $y = mx + c$; • Find the equation of a straight line from a graph in the form $y = mx + c$; • Plot and draw graphs of straight lines of the form $y = mx + c$ with and without a table of values; • Sketch a graph of a linear function, using the gradient and y-intercept (i.e. without a table of values); • Find the equation of the line through one point with a given gradient; • Identify and interpret gradient from an equation $ax + by = c$; • Find the equation of a straight line from a graph in the form $ax + by = c$; • Plot and draw graphs of straight lines in the form $ax + by = c$; • Interpret and analyse information presented in a range of linear graphs: • use gradients to interpret how one variable changes	

in relation to another;

- find approximate solutions to a linear equation from a graph;
- identify direct proportion from a graph;
- find the equation of a line of best fit (scatter graphs) to model the relationship between quantities;
- Explore the gradients of parallel lines and lines perpendicular to each other;
- Interpret and analyse a straight-line graph and generate equations of lines parallel and perpendicular to the given line;
- Select and use the fact that when $y = mx + c$ is the equation of a straight line, then the gradient of a line parallel to it will have a gradient of m and a line perpendicular to this line will have a gradient of $-\dfrac{1}{m}$.

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| Unit 6: Non Linear Graphs | Recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape; Generate points and plot graphs of simple quadratic functions, then more general quadratic functions; Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function; Interpret graphs of quadratic functions from real-life problems; Draw graphs of simple cubic functions using tables of values; Interpret graphs of simple cubic functions, including finding solutions to cubic equations; Draw graphs of the reciprocal function $y = \dfrac{1}{x}$ with $x \neq 0$ using tables of values; Draw circles, centre the origin, equation $x^2 + y^2 = r^2$. | End of Unit Test |

- Revision and Exam Prep

End of year assessment
This will include all topics covered
Misconceptions will be addressed as part of the end of year assessment review process