Scheme of Work



Subject: Maths 2023/2024

	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
Key Stage 3 (Y9)	**Integers and indices** understand and use place value for decimals, measures and integers of any size recognise and use relationships between operations including inverse operations use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations interpret and compare numbers in standard form A x 10^n $1 \leq A < 10$, where n is a positive or negative integer or zero use a calculator and other technologies to calculate results accurately and then interpret them appropriately	**Angles** describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles understand and use the relationship between parallel lines and alternate and corresponding angles	**Function and Sequences** simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms multiplying a single term over a bracket taking out common factors expanding products of two or more binomials understand and use standard mathematical formulae; rearrange formulae to change the subject model situations or procedures by translating them into algebraic expressions or formulae and by using graphs work with coordinates in all four quadrants recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane interpret mathematical relationships both algebraically and graphically	**Ration and Proportion** use ratio notation, including reduction to simplest form 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 understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions **Transformation TC15 / 18** identify properties of, and describe the results of, translations, rotations and reflections applied to given figures identify and construct congruent triangles, and construct similar shapes by	**Perimeter and Volume** use standard units of mass, length, time, money and other measures, including with decimal quantities use and interpret algebraic notation, including: ab in place of $a \times b$ $3y$ in place of $y + y + y$ and $3 \times y$ a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$ a/b in place of $a \div b$ coefficients written as fractions rather than as decimals substitute numerical values into formulae and expressions, including scientific formulae recognise arithmetic sequences and find the nth term use algebraic methods to solve linear equations in one	**Pythagoras & trigonometry TC22, TC24** calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles **Circles and Cylinders TC16** calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes derive and illustrate properties of triangles, quadrilaterals, circles, and

	appreciate the infinite nature of the sets of integers, real and rational numbers. **Factors and Multiples** understand and use place value for decimals, measures and integers of any size use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property . TC**1** use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals interpret and compare numbers in standard form A x 10^n $1 \leq A < 10$, where n is a	derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons **Fractions and Decimals** understand and use place value for decimals, measures and integers of any size order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥ use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative work interchangeably with terminating decimals and their corresponding fractions	recognise arithmetic sequences and find the nth term recognise geometric sequences and appreciate other sequences that arise. TC4 **Estimation and Approximation** round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a<x\leq b$ substitute numerical values into formulae and expressions, including scientific formulae understand and use standard mathematical formulae; rearrange formulae to change the subject	enlargement, with and without coordinate grids use scale factors, scale diagrams and maps **Percentages** define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% interpret fractions and percentages as operators solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics **Angles and Polygons**	variable (including all forms that require rearrangement) change freely between related standard units [for example time, length, area, volume/capacity, mass] **Direct and Inverse Proportion** solve problems involving direct and inverse proportion, including graphical and algebraic representations find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs **Congruent and Similar shape** use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles	other plane figures [for example, equal lengths and angles] using appropriate language and technologies derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders) use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D substitute numerical values into formulae and expressions, including scientific formulae understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

	positive or negative integer or zero use a calculator and other technologies to calculate results accurately and then interpret them appropriately **Expressions and Formulae** use and interpret algebraic notation, including: ab in place of $a \times b$ $3y$ in place of $y + y + y$ and $3 \times y$ a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$ a/b in place of $a \div b$ coefficients written as fractions rather than as decimals substitute numerical values into formulae and expressions, including scientific formulae understand and use the concepts and vocabulary of expressions, equations,	(such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$) define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% interpret fractions and percentages as operators express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1 understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction	**Graphs** recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations . TC6 **Gradients** reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically understand and use standard mathematical formulae; rearrange formulae to change the subject relate the language of ratios and the associated	describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons interpret mathematical relationships both algebraically and geometrically.	identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs use scale factors, scale diagrams and maps **TC21** **Compound units** use standard units of mass, length, time, money and other measures, including with decimal quantities change freely between related standard units [for example time, length, area, volume/capacity, mass] use compound units such as speed, unit pricing and density to solve problems.	understand and use standard mathematical formulae; rearrange formulae to change the subject **Charts and Averages TC26/27 TC28 TC29** describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers) construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data describe simple mathematical relationships between two variables (bivariate data) in observational and

	inequalities, terms and factors simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms multiplying a single term over a bracket taking out common factors expanding products of two or more binomials understand and use standard mathematical formulae; rearrange formulae to change the subject order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥ recognise and use relationships between operations including inverse operations	**Theoretical and Experimental Probability** record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale understand that the probabilities of all possible outcomes sum to 1 enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities. TC11 **2D & 3D Shapes** describe, sketch and draw using conventional terms and notations: points, lines,	calculations to the arithmetic of fractions and to linear functions		solve problems involving direct and inverse proportion, including graphical and algebraic representations substitute numerical values into formulae and expressions, including scientific formulae find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs	experimental contexts and illustrate using scatter graphs. **Bearings and scale** draw and measure line segments and angles in geometric figures, including interpreting scale drawings derive and 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); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids use scale factors, scale diagrams and maps

	Equations and inequalities understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors TC7 use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥ appreciate the infinite nature of the sets of integers, real and rational numbers.	parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D				
	N 1,6,7,8,15,16,1,15,3,5,2 **A: 1,2,3,4,5,6,7**	**G: 5,6,7,10,11,12,15** **R: 3,6** **P1,2,3,4**	**N: 4,5,6,7,13,14** **A: 2,3,4,5,6,8,9,10,12, 14,15,16,** **R: 7**	**N:12,** **A:3,7,2,13** **G:1,2,15,13,6,9,13** **R:1,9,2,10**	**A: 2,3,5** **G:2,7,14,1,15** **S: 1,2,3**	**G: 3,4,9,** **R:2**

	Reason mathematically **Solve problems**					

	AUTUMN 1 (Week 1-8)	AUTUMN 2 (Week 9-15)	SPRING 1 (Week 16-20)	SPRING (Week 21-25)	SUMMER 1 (Week 26 - 31)	SUMMER 2 (Week 32-39)
Year 10	Numbers N2,N3,N4,N6,N7, A4 *Directed Numbers* Use non-calculator methods to calculate the sum, difference, product of positive and negative whole numbers. *4 Rules of Numbers* *Types of Numbers* Understand and use the terms odd, even, prime, factor (divisor), multiple, common factor (divisor), common multiple, square, cube, root. Understand and use place value. *Rules of Indices* Use positive integer indices to write, for example, $2 \times 2 \times 2 \times 2 = 2^4$ Use negative integer indices to represent reciprocals. Use fractional indices to represent roots and combinations of powers and roots. Recognise simple powers Calculate with integer powers. e.g. $2^{-3} = \frac{1}{8}$	Simple algebraic Fraction A1,A4 Simplify and manipulate algebraic fractions. TC10 ***Substitution*** ***A2,A5*** Substitute positive numbers into simple expressions and formulae to find the value of the subject. ***Substitute positive or negative numbers into more complex formulae, including powers, roots and algebraic fractions.*** Geometry G7,G8,G24 Reflect a simple shape in a given mirror line, and identify the mirror line from a shape and its image. Identify a mirror line x = a, y = b or y = ± x from a simple shape and its image under reflection. Rotate a simple shape clockwise or anti-clockwise through a multiple of 90c about a given centre of rotation. Use a column vector to describe a translation of a simple shape, and perform a specified translation. ***Perform a sequence of isometric transformations (reflections,***	Probability Venn Diagrams Use a two-circle Venn diagram to enumerate sets, and use this to calculate related probabilities. Use simple set notation to describe simple sets of numbers or objects. Construct a Venn diagram to classify outcomes and calculate probabilities. Use set notation to describe a set of numbers or objects. Knowledge of intersection (∩), union ( ) and complement (') notation will not be required. ***Venn diagrams to solve more complex probability problems (including conditional probabilities; structure for diagrams may not be given). [Knowledge of intersection (∩), union ( ) and complement (') notation will not be required.]*** ***TC13*** Number N4 HCF & HCF Find the HCF and LCM of two whole numbers by listing. Find the HCF and LCM of two whole numbers from their prime factorisations.	Algebra N1,A3,A22 ***Solving Inequalities & representing on number line*** Understand and use the symbols <, > EQUAL TO AND….. Solve linear inequalities in one variable, expressing solutions on a number line using the conventional notation. e.g 2x+1H7 Solve quadratic inequalities in one variable. e.g. x2-2x13 ***TC6*** ***TC7*** Linear Sequences A23,A25 Generate a sequence by spotting a pattern or using a term-to-term rule given algebraically or in words. Find a position-to-term rule for simple arithmetic sequences, algebraically or in words. e. Generate a sequence from a formula for the *n*th term. Find a formula for the *n*th term of an arithmetic sequence. ***Use subscript notation for position-to-term and term-to-term rules.*** ***Find a formula for the nth term of a quadratic sequence.***	Number N12, R3,R6 ***Fraction Change*** Calculate a fraction of a quantity. e.g. 25 of £3.50 Express one quantity as a fraction of another. Calculate with fractions greater than 1. Algebra A8,A9,A14,13 ***Simple graph*** Work with *x*- and *y*-coordinates in all four quadrants. ***Staight Line graph (y=mx+c)*** Use a table of values to plot graphs of linear and quadratic functions. e.g. *y*=2*x*+3 *y* = 2*x*2 + 1 Recognise and sketch the graphs of simple linear and quadratic functions. e.g. *y* = 2 *x* =1 *y* = 2*x* *y* = *x*2 Recognise and sketch graphs of:*y*=*x*3, *y*=1*x*. ***Quadratic graph (a=1)*** Use a table of values to plot other polynomial graphs and reciprocals. e.g. y=x3-2x y = x + 1x 2x+3y = 6	Number/Ratio N2,N9,R8,N10 ***Repeat Percentage Change*** Increase or decrease a quantity by a simple percentage, including simple decimal or fractional multipliers. Apply this to simple original value problems and simple interest. ***FDP Equivalents*** Express a simple fraction as a terminating decimal or vice versa, without a calculator. e.g. 0.4 = 25 Understand and use place value in decimals. Use division to convert a simple fraction to a decimal. e.g. 16 = 0.16666... Convert a recurring decimal to an exact fraction or vice versa. e.g. 0.41 = 41 oo 99 ***Decimals*** Add, subtract and multiply decimals including negative decimals, without a calculator. Divide a decimal by a whole number, including negative decimals, without a calculator.

Calculate with roots. of 2, 3, 4 and 5.
Know and apply:
$a^m \times a^n = a^{m+n}$
$a^m / a^n = a^{m-n}$
$(a^M)^n = a^{mn}$

Algebraic Manipulation A1,A3,A4,N4

Collecting like terms, simplifying

use and interpret algebraic notation. Simplify algebraic Simplify algebraic products and quotients using the laws of indices.
Simplify algebraic expressions by multiplying a single term over a bracket.
e.g. $2(a+3b) = 2a+6b$
Expand products of two binomials.

Expand products of more than two binomials.

Rules of Indices

Use positive integer indices to write, for example,
2 X 2 X 2 X 2 = 24
Use negative integer indices to represent reciprocals.
Use fractional indices to represent roots and combinations of powers and roots.

rotations or translations), on a simple shape. Describe the resulting transformation and the changes and invariance achieved.

Pythagoras G6,G20

apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in two {and three} dimensional figures
Apply Pythagoras' theorem in more complex figures, including 3D figures.

Number

Factors Multiples and Prime N2,N4,N6

Understand and use the terms odd, even, prime, factor (divisor), multiple, common factor (divisor), common multiple.

Identify prime numbers less than 20.

Express a whole number as a product of its prime factors.
e.g. 24 = 2#2#2#3 TC1

Understand that each number can be expressed as a product of prime factors in only one way.

Rounding & stimation

Round numbers to the nearest whole number, ten, hundred, etc. or to a given number of significant figures (sf) or decimal places (dp).

Round answers to an appropriate level of accuracy.
Estimate or check, without a calculator, the result of more complex calculations including roots.
Use the symbol ≈ appropriately.

Estimate or check, without a calculator, the result of a calculation by using suitable approximations.

e.g. Estimate, to one significant figure, the cost of 2.8 kg of potatoes at 68p per kg.

Algebra

Factorising

Take out common factors. e.g.
3a-9b = 3(a-3b) 2x+3x2 =x(2+3x*)*

Factorise & Solve Quadratic (a=1)

Factorise quadratic expressions of the form x2 + bx + c .

Factorise quadratic expressions of the form ax2 + bx + c (where a ≠ 0 or 1)

TC9

Number

Equivalent fractions

Recognise and use equivalence between simple fractions and mixed numbers.

Adding and subtracting/ Multiplying Dividing

Add, subtract, multiply and divide simple fractions (proper and improper), including mixed numbers and negative fractions.
Carry out more complex calculations, including the use of improper fractions.

Identify intercepts and, using symmetry, the turning point of graphs of quadratic functions.
Find the roots of a quadratic equation algebraically.

Use a table of values to plot exponential graphs. e.g. y = 3#1.1x

Sketch graphs of quadratic functions, identifying the turning point by completing the square.

Number/Ratio N9,N12,R8

Percentage Intro

Convert between fractions, decimals and percentages.

Understand percentage is 'number of parts per hundred'.
Calculate a percentage of a quantity, and express one quantity as a percentage of another, with or without a calculator.

Percentage Increase/Decrease

Increase or decrease a quantity by a simple percentage, including simple decimal or fractional multipliers.
Apply this to simple original value problems and simple interest.

Ratio 1 R4, R5,R6

Find the ratio of quantities in the form *a* : *b* and simplify.
Find the ratio of quantities in the form 1 : *n*.
e.g. 50 cm : 1.5 m = 50 : 150 = 1 :3

Split a quantity into two parts given the ratio of the parts.
e.g. £2.50 in the ratio 2 : 3
Express the division of a quantity into two parts as a ratio.
Calculate one quantity from another, given the ratio of the two quantities.

Split a quantity into three or more parts given the ratio of the parts.

Geometry G16,G17,G18

Area & Perimeter

Know and apply the formula: area = 12 base × height.
Know and apply the formula: area = base × height. [Includes area of a rectangle]

Calculate the area of a trapezium.

	Recognise simple powers Calculate with integer powers. e.g. 2-3=18 Calculate with roots. of 2, 3, 4 and 5. Know and apply: am x an = am + n am '/ an = am - n _ (aM)n = amn Solving equations (1,2,Brackets) Set up and solve linear equations in mathematical and non-mathematical contexts, including those with the unknown on both sides of the equation. e.g. Solve 5(x - 1) = 4 - x Interpret solutions in context.	Identify prime numbers. Use power notation in expressing a whole number as a product of its prime factors. e.g. 600 = 23 #3#52			solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics TC12	Circles Know and apply the formula area = rr2 to calculate the area of a circle. Parts of Circles Calculate the area of a sector of a circle given its angle and radius. TC20 Apply area formulae in calculations involving the area of composite 2D shapes. Know and apply the formula: area = 12 ab sin C . Volume Surface area (Prisms) Calculate the surface area and volume of cuboids and other right prisms (including cylinders).
	N: A: R: 10 S: 1,2,4,5	**N: 14,15,8** **A: 4,5,3,2,21** **R: 10** **G: 17,18,16,20,6**	**N: 11,12,16** **R: 4,5,6,7,8,9,10,12,13** **G: 2,6,3,4**	**N: 1,2,3,10** **A: 11,17,18,19,8,9,14,3,21** **R: 9,6,3** **S: 6,4**	**N: 6,7,9,2,8,15,3,17,21,22** **A: 4,1,9,14,10,22** **R: 12,1,11** **G: 21,14**	**N: 8** **R: 2** **G: 15,1,12,13,17**
	TCs:	**TCs:**	**TCs:**	**TCs:**	**TCs:**	**TCs:**
	AOs: AO1, AO2 AO3	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**

	AUTUMN 1 (Week 1-8)	AUTUMN 2 (Week 9-15)	SPRING 1 (Week 16-20)	SPRING (Week 21-25)	SUMMER 1 (Week 26 - 31)	SUMMER 2 (Week 32-39)
Year 11	*Geometry G2,G3,G6* Angle Facts Know the terms acute, obtuse, right and reflex angles. Use the standard conventions for labelling and referring to the sides and angles of triangles. e.g. AB, +ABC, angle ABC, a is the side opposite angle A Know and use the sum of the angles at a point is 360c. Know that the sum of the angles at a point on a line is 180c. Know and use: vertically opposite angles are equal alternate angles on parallel lines are equal corresponding angles on parallel lines are equal. Polygon (Int & Ext) Derive and use the sum of the interior angles of a triangle is 180c. Derive and use the sum of the exterior angles of a polygon is 360c. Find the sum of the interior angles of a polygon. Find the interior angle of a regular polygon.	Statistics S1,2,3,4 Frequency Chart Interpret and construct charts appropriate to the data type; including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data. Interpret multiple and composite bar charts. Design tables to classify data. Interpret and construct line graphs for time series data, and identify trends (e.g. seasonal variations). Charts and table (Pie and two Way) Scatter Diagrams, Frequency trees Averages (list, table,stem & Leaf) Calculate the mean, mode, median and range for ungrouped data. Find the modal class, and calculate estimates of the range, mean and median for grouped data, and understand why they are estimates. Describe a population using statistics. Make simple comparisons. Compare data sets using 'like for like' summary values. Understand the advantages and disadvantages of summary values.	Algebra A9,A10,19,22 Straight Line Graph (Parallel) Identify and find equations of parallel lines. **Identify and find equations of perpendicular lines.** **Calculate the equation of a tangent to a circle at a given point.** A14,R14,R10 Travel Graph Construct and interpret graphs in real-world contexts. e.g. distance-time money conversion temperature conversion Recognise and interpret graphs that illustrate direct and inverse proportion. Compound Measure N13, R1, R11, G14 Use and convert standard units of measurement for length, area, volume/capacity, mass, time and money. Use and convert other compound units (e.g. density, pressure).	Bearings G1,R2,G15 Use the scale of a map, and work with bearings. Construct and interpret scale drawings. Use the terms points, lines, line segments, vertices, edges, planes, parallel lines, perpendicular lines. Views and Maps G1,G13 Interpret plans and elevations of simple 3D solids. Construct plans and elevations of simple 3D solids, and representations (e.g. using isometric paper) of solids from plans and elevations. G2 Loci / Constructions Construct the perpendicular bisector and midpoint of a line segment. Construct the bisector of an angle formed from two lines. Construct the perpendicular from a point to a line. Construct the perpendicular to a line at a point. Know that the perpendicular distance from a point to a line is	**Drop down days, exams, Year 11 leaving**	

	Apply these angle facts to find angles in rectilinear figures, and to justify results in simple proofs. e.g. The sum of the interior angles of a triangle is 180c. **Apply these angle properties in more formal proofs of geometrical results.** Parallel Lines Know and use: vertically opposite angles are equal alternate angles on parallel lines are equal corresponding angles on parallel lines are equal. Number N9 Standard Form(writing) Interpret and order numbers expressed in standard form. Convert numbers to and from standard form. e.g. 1320 = 1.32 # 103 , 0.00943 = 9.43 # 10-3 Use a calculator to perform calculations with numbers in standard form.TC2 Standard Form(-,=,x,/) Add, subtract, multiply and divide numbers in standard form, without a calculator.	**Interpret and construct diagrams for grouped data as appropriate, i.e. cumulative frequency graphs and histograms (with either equal or unequal class intervals).** **Calculate estimates of mean, median, mode, range, quartiles and interquartile range from graphical representation of grouped data.** **Draw and interpret box plots.** **Use the median and interquartile range to compare distributions.** Probability P1,P2,P3,P5,P6,P9 Scale, equally likely events Use the 0-1 probability scale as a measure of likelihood of random events, for example, 'impossible' with 0, 'evens' with 0.5, 'certain' with 1. Sample Space,venn,experimental Record, describe and analyse the relative frequency of outcomes of repeated experiments using tables and frequency trees. Use relative frequency as an estimate of probability. Understand that relative frequencies approach the	Know and apply: density = mass ÷ volume Use and convert compound units in algebraic contexts. Use and convert other compound units (e.g. density, pressure). Know and apply: density = mass ÷ volume Use and convert compound units in algebraic contexts. Translate and VectorG7,G24 G25 Use a column vector to describe a translation of a simple shape, and perform a specified translation. Understand addition, subtraction and scalar multiplication of vectors. Represent a 2-dimensional vector as a column vector, and draw column vectors on a square or coordinate grid. TC17 TC18	the shortest distance to the line. Apply ruler and compass constructions to construct figures and identify the loci of points, to include real-world problems. Understand the term 'equidistant'.		

	Ratio N11, R5, R6, R8 Ratio, Fraction, Direct Best Buy Interpret a ratio of two parts as a fraction of a whole. e.g. £9 split in the ratio 2 : 1 gives parts 2/3 X £9 and 1/3 X £9. Solve simple problems involving quantities in direct proportion including algebraic proportions. Solve more formal problems involving quantities in direct proportion (i.e. where y ? x). Recognise that if y = kx, where k is a constant, then y is proportional to x. TC21 Solve simple ratio and proportion problems. e.g. Adapt a recipe for 6 for 4 people. Understand the relationship between ratio and linear functions. *Formulate equations and solve problems involving a quantity in direct proportion to a power or root of another quantity.* Algebra A19,21 Solving Equations Set up and solve linear equations in mathematical and non-mathematical contexts, including	theoretical probability as the number of trials increases. Use tables and grids to list the outcomes of single events and simple combinations of events, and to calculate theoretical probabilities. Use sample spaces for more complex combinations of events. **Recognise when a sample space is the most appropriate form to use when solving a complex probability problem.** **Use the most appropriate diagrams to solve unstructured questions where the route to the solution is less obvious.** Construct a Venn diagram to classify outcomes and calculate probabilities. Use set notation to describe a set of numbers or objects. **Construct tree diagrams, two-way tables or Venn diagrams to solve more Complex probability problems (including conditional probabilities; structure for diagrams may not be given). TC13** Probability tree Use tree diagrams to enumerate sets and to record the probabilities of successive events (tree frames may be				

	those with the unknown on both sides of the equation. e.g. Solve 5(x - 1) = 4 - x Interpret solutions in context. Simultaneous Equations Set up and solve two linear simultaneous equations in two variables algebraically. e.g. Solve simultaneously 2x+3y = 18 and y = 3x - 5 TC5 **Set up and solve two simultaneous equations in two variables algebraically (including where one is a quadratic or that result in a quadratic).** **e.g. Solve simultaneously x2+y2 =50and2y=x+5** **TC9 TC8**	given and in some cases will be partly completed).				
	N: A: 9,10,16,22,9,10, R: 12 G: 9,17,18,3,6,3,1,4,6,20,7,11, P: 1,2,3,4,5,6,7,8,9	**N:** **A: 23,25,24,2,3,5,9,109,22,14,15** **R: 8,14,15,10** **G: 16,17,18,23,6,20** **P:**	**N: 2,8** **A: 11,12,7,9,14** **R:** **G: 1,4,7,24,5,7,6,19** **P:**	**N:** **A: 11,12,9,14,7** **R:** **G: 25** **P:**		
	TCs:	**TCs:**	**TCs:**	**TCs:**	**TCs:**	**TCs:**

	AOs: AO1, AO2 AO3	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**	**AOs:** **AO1, AO2 AO3**

<u>Threshold Concepts</u> (Key Stage 3 & 4)

Foundation Threshold concepts (Foundation KS4) ***(Higher KS4)***

Number

TC1. 4. Every positive integer (greater than 1) has a unique prime factor decomposition.
TC2. 9. Standard form is useful in comparing numbers of varying magnitudes.
TC3. ***8. Surds can be calculated with but won't always result in 'nice-looking' answers.***
TC4. ***Find the nth term of linear, geometric and quadratic sequences.***

Algebra

TC5. 18 Simultaneous equations can be solved algebraically or graphically.
TC6. 21 The method for solving a linear inequality is almost identical to that of a linear equation.
TC7. 16. Solid and dotted lines represent different things on an inequality graph
TC8. Factorising a quadratic will result in two values of X
TC9. ***18 Simultaneous equations with a quadratic involved can result in two solutions.***
TC10. ***4. Algebraic fractions can be simplified by dividing the numerator and denominator by a common factor.***

Percentage / Probability

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TC11. Samples spaces represent different ways of interpreting probability problems.
TC12. Probability can be represented a fraction, decimal or percentage.
TC13. Know the difference between simple and compound interest.
TC14. Problems with conditional probability require more careful consideration.

Geometry

TC15. There can be several ways of describing a shapes transformation.
TC16. Pi (π) is ,the constant ratio between the circumference and diameter of any circle.
TC17. Vectors represent a translation and can be written in column vector form.
TC18. There are 4 main types of transformation.
TC19. Upper and lower bounds show the margin of error as a result of rounding.
TC20. A sector is a fraction of a circle.

Similarity

TC21. Proportion problems can be represented algebraically, graphically or in a table.
TC22. Pythagoras' theorem states that that for a right- angled triangle $a^2 + b^2 = c^2$ where c is the hypotenuse
TC23. Speed, density and pressure are all examples of compound measures.
TC24. Problems involving right- angled triangles can be solved using Pythagoras or the sin/cos/tan ratios.
TC25. For non-right angled triangles the following can be used: sine rule; cosine rule; area of a triangle using sine rule

Data Handling

TC26. Scatter diagrams are used to show trends in a data set.
TC27. Scatter diagrams cannot show trends outside of their data set
TC28. Averages can be calculated from a frequency table and estimated from a grouped-data table
TC29. Boxplots can be used to compare the distribution of two data sets.

National Curriculum Links (Key Stage 3)

NUMBER

N1. understand and use place value for decimals, measures and integers of any size

N2. order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥

N3. use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property

N4. use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative

N5. use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals

N6. recognise and use relationships between operations including inverse operations

N7. use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations

ALGEBRA

A1. use and interpret algebraic notation, including:

- ab in place of $a \times b$
- $3y$ in place of $y + y + y$ and $3 \times y$
- a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$
- a/b in place of $a \div b$

A2. coefficients written as fractions rather than as decimals brackets

A3. substitute numerical values into formulae and expressions, including scientific formulae

A4. understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

A5. simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms

A6. multiplying a single term over a bracket

A7. taking out common factors

A8. expanding products of two or more binomials

A9. understand and use standard mathematical formulae; rearrange formulae to change the subject

A10. model situations or procedures by translating them into algebraic expressions or formulae and by using graphs

GEOMETRY

G1. derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)

G2. calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes

G3. draw and measure line segments and angles in geometric figures, including interpreting scale drawings

G4. derive and 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); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line

G5. describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric

G6. use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles

G7. derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and

PROBABILITY

P1. record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale

P2. understand that the probabilities of all possible outcomes sum to 1

P3. enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams

P4. generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities.

Statistics

S1. describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)

S2. construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and

N8. interpret and compare numbers in standard form A x 10^n $1 \leq A < 10$, where n is a positive or negative integer or zero

N9. work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)

N10. define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%

N11. interpret fractions and percentages as operators

N12. use standard units of mass, length, time, money and other measures, including with decimal quantities

N13. round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]

N14. use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$

N15. use a calculator and other technologies to calculate results accurately and then interpret them appropriately

A11. use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)

A12. work with coordinates in all four quadrants

A13. recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane

A14. interpret mathematical relationships both algebraically and graphically

A15. reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically

A16. use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations

A17. find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs

A18. generate terms of a sequence from either a term-to-term or a position-to-term rule

A19. recognise arithmetic sequences and find the nth term

A20. recognise geometric sequences and appreciate other sequences that arise.

angles] using appropriate language and technologies

G8. identify properties of, and describe the results of, translations, rotations and reflections applied to given figures

G9. identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids

G10. apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles

G11. understand and use the relationship between parallel lines and alternate and corresponding angles

G12. derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons

G13. apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs

G14. use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles

G15. use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D

G16. interpret mathematical relationships both algebraically and geometrically.

vertical line (or bar) charts for ungrouped and grouped numerical data

S3. describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs.

N16. appreciate the infinite nature of the sets of integers, real and rational numbers.			

Assessment Objectives (Key Stage 4)

AO1: **Use and apply standard techniques**

AO2: **Reason, interpret and communicate mathematically**

AO3: **Solve problems within mathematics and in other contexts**

National Curriculum Links (Key Stage 4

NUMBER

N1. order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥

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)

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

ALGEBRA

Notation, vocabulary and manipulation

A1. use and interpret algebraic notation, including:

a. ab in place of $a \times b$

b. $3y$ in place of $y + y + y$ and $3 \times y$

c. a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ a

d. $\frac{}{}$ in place of $a \div b$ b

e. coefficients written as fractions rather than as decimals ? brackets

A2. substitute numerical values into formulae and expressions, including scientific formulae

A3. understand and use the concepts and vocabulary of expressions, equations,

GEOMETRY

Properties and constructions

G1. use conventional terms and notations: 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

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

PROBABILITY

1. record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees
2. apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments
3. relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale
4. 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

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

N5. apply systematic listing strategies **including use of the product rule for counting**

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**

N7. calculate with roots, and with integer **and fractional** indices

N8. calculate exactly with fractions, **surds** and multiples of π**; simplify surd**

- **a. expressions involving squares**
- **b. (and rationalise denominators**

N9. calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer.

N10. Fractions, decimals and percentages

N11. 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 decimals into their corresponding fractions and vice versa**

N12. identify and work with fractions in ratio problems

N13. interpret fractions and percentages as operators.

formulae, identities inequalities, terms and factors

A4. simplify and manipulate algebraic expressions (including those involving surds **and algebraic fractions**) by:

a. collecting like terms
b. multiplying a single term over a bracket
c. taking out common factors
d. expanding products of two **or more** binomials
e. factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares**; factorising quadratic expressions of the form $ax^2 + +bx\ c$**
f. simplifying expressions involving sums, products and powers, including the laws of indices

A5. understand and use standard mathematical formulae; rearrange formulae to change the subject

A6. 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**

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'.**

Graphs

A8. work with coordinates in all four quadrants

distance from a point to a line is the shortest distance to the line

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 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

G5. use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)

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

G7. identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement

- a. (including fractional **and negative** scale factors)

G8. **describe the changes and invariance achieved by combinations of rotations, reflections and translations**

G9. identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

5. understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
6. enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams
7. construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities
8. calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions
9. **calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams.**

Probability

1. record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees
2. apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments
3. relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale
4. apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an

N14. Measures and accuracy

N15. use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate

N16. estimate answers; check calculations using approximation and estimation, including answers obtained using technology

N17. 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

N18. apply and interpret limits of accuracy, **including upper and lower bounds**

Ratio, proportion and rates of change

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

R2. use scale factors, scale diagrams and maps

R3. express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1

R4. use ratio notation, including reduction to simplest form

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

A10. identify and interpret gradients and intercepts of linear functions graphically and algebraically

A11. identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically **and turning points by completing the square**

A12. recognise, sketch and interpret graphs of linear functions, quadratic functions,

A13. simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, **exponential** x **functions** $y = k^x$ **for positive values of** k**, and the trigonometric functions (with arguments in degrees)** $y = \sin x$, $y = \cos x$ **and** $y = \tan x$ **for angles of any size**

A14. **sketch translations and reflections of a given function**

A15. 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

A16. **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**

A17. **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.**

G10. **apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results**

G11. solve geometrical problems on coordinate axes

G12. identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres

G13. construct and interpret plans and elevations of 3D shapes.

Mensuration and calculation

G14. use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)

G15. measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings

G16. know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)

G17. know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^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

G18. calculate arc lengths, angles and areas of sectors of circles

G19. apply the concepts of congruence and similarity, including the relationships between lengths, **areas and volumes** in similar figures

exhaustive set of mutually exclusive events sum to one

5. understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size

6. enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams

7. construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities

8. calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions

9. **calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams.**

Statistics

1. infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling

2. 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

3. **construct and interpret diagrams for grouped discrete data and continuous data, i.e.**

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)

R6. express a multiplicative relationship between two quantities as a ratio or a fraction

R7. understand and use proportion as equality of ratios

R8. relate ratios to fractions and to linear functions

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

Solving equations and inequalities

A19. solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph

A20. 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

A21. solve two simultaneous equations in two variables (linear/linear **or linear/quadratic**) algebraically; find approximate solutions using a graph

A22. **find approximate solutions to equations numerically using iteration**

A23. 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.

A24. 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**

Sequences

A25. generate terms of a sequence from either a term-to-term or a position-to-term rule

A26. 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

G20. know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$, and the trigonometric

a. angles and lengths in right-angled triangles **and, where possible, general triangles** in two **and three** dimensional figures

G21. know the exact values of $\sin\theta$ and $\cos\theta$ for $\theta = 0^0, 30^0, 45^0, 60^0$ and 90^0; know the exact value of $\tan\theta$ for $\theta = 0^0, 30^0, 45^0$ and 60^0

G22. **, and cosine rule, sin *A* sin *B* sin*C***

a. **$a^2 = + - b^2 c^2 2bc\cos A$, to find unknown lengths and angles**

G23. **know and apply Area = $\frac{1}{2}ab\sin C$ to calculate the area, sides or angles of any triangle.**

Vectors

G24. describe translations as 2D vectors

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**

histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use

4. interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:

- appropriate graphical representation involving discrete, continuous and grouped data, **including box plots**
- appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers**, quartiles and inter-quartile range**)

5. apply statistics to describe a population

6. 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 whilst knowing the dangers of so doing

	is a rational number > 0 **or a surd**) **and other sequences** A27. deduce expressions to calculate the n^{th} term of linear **and quadratic** sequences.		

Assessment Objectives (Key Stage 4)

AO1: Use and apply standard techniques

A. accurately recall facts, terminology and definitions
B. use and interpret notation correctly
C. accurately carry out routine procedures or set tasks requiring multi-step solutions

AO2: Reason, interpret and communicate mathematically

A. make deductions, inferences and draw conclusions from mathematical information
B. construct chains of reasoning to achieve a given result
C. interpret and communicate information accurately
D. present arguments and proofs
E. assess the validity of an argument and critically evaluate a given way of presenting information
F.

AO3: Solve problems within mathematics and in other contexts

A. translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes
B. make and use connections between different parts of mathematics
C. interpret results in the context of the given problem
D. evaluate methods used and results obtained
E. evaluate solutions to identify how they may have been affected by assumptions made

Key Words			
Number	**Algebra**	**Ratio**	**Geometry**
1. accuracy	43. arithmetic sequence	90. compare	115.acute
2. approximation	44. brackets	91. compound interest	116.adjacent
3. calculation	45. changing the subject	92. compound measures	117.alternate angle
4. convert	46. coefficient	93. compound units	118.angle bisector
5. cube	47. collecting like terms	94. convert	119.arc
6. cube root	48. common factor	95. decay	120.area
7. decimal places	49. coordinates	96. density	121.ASA, SAS, SSS, RHS
8. decimals	50. cubic graph	97. distance	122.bearings
9. error interval	51. equation	98. gradient	123.capacity
10. estimate	52. equivalent	99. growth	124.chord
11. Factor	53. expand	100.integer	125.circle
12. HCF	54. expression	101.maps	126.circumference
13. improper fraction	55. factorise	102.mass	127.composite solid
14. index / indices	56. Fibonacci sequence	103.percentage change	128.cone
15. index laws	57. formula	104.quantities	129.congruent
16. inequality	58. function	105.rates of change	130.constructions
17. integer	59. geometric sequence	106.ratio	131.corresponding angle
18. irrational	60. gradient	107.real-life graph	132.cosine (cos)
19. LCM	61. identity	108.scale factor	133.cube
20. limits	62. indices	109.share	134.cuboid
21. mixed number	63. inequality	110.similar	135.cylinder
22. multiple	64. intercept	111.simple interest	136.decagon
23. negative	65. linear equation	112.speed	137.diameter
24. ordering	66. linear sequence	113.time	138.dodecagon
25. percentage	67. manipulation	114.volume	139.edge
26. place value	68. ***n***th term		140.elevation

27. positive
28. power
29. prime factor tree
30. prime factorisation
31. prime number
32. proper fraction
33. ratio
34. rational
35. real number
36. recurring
37. **rounding**
38. **significant figures**
39. **standard form**
40. **square**
41. **square root**
42. **units**

69. number machines
70. parallel
71. perpendicular
72. position-to-term rule
73. quadrants
74. quadratic equation
75. quadratic graph
76. quadratic sequence
77. rearrange
78. reciprocal graph
79. roots
80. sequence
81. simplify
82. simultaneous
83. solution
84. solve
85. substitution
86. term
87. term-to-term rule
88. variable
89. $y = mx + c$

Statistics

206. bar chart
207. continuous
208. correlation
209. cumulative frequency
210. data
211. discrete
212. distribution
213. frequency
214. grouped
215. line chart
216. line of best fit
217. mean
218. median
219. modal class
220. mode
221. outlier
222. pictogram
223. pie chart
224. population
225. range
226. sample
227. scatter graph
228. table
229. time series
230. ungrouped

141. enlargement
142. equilateral
143. face
144. heptagon
145. hexagon
146. hypotenuse
147. irregular polygon
148. isosceles
149. kite
150. length
151. line
152. locus / loci
153. nonagon
154. obtuse
155. octagon
156. opposite
157. parallel
158. parallelogram
159. pentagon
160. perimeter
161. perpendicular
162. perpendicular
163. bisector
164. pi / **π**
165. plan view
166. point
167. polygon
168. prism
169. pyramid
170. Pythagoras' theorem
171. quadrilateral
172. radius
173. rectangle

			174.reflection 175.reflex 176.regular polygon 177.rhombus 178.right angle 179.right-angled triangle 180.rotation 181.scalar 182.scale factor 183.scalene 184.sector 185.segment 186.similar 187.sine (sin) 188.SOHCAHTOA 189.sphere 190.square 191.surface area 192.symmetry 193.tan 194.tangent 195.transformation 196.translation 197.trapezium 198.triangle 199.trigonometric ratios 200.units 201.vector 202.vertex / vertices 203.vertically opposite 204.angle 205.volume

	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
Key Stage 3 (Y8)	**Estimation and rounding** Round numbers to a required number of decimal places. Round numbers to a required number of significant figures. Estimate calculations by rounding. **Sequences**	**Graphical representations of linear relationships** Connect coordinates, equations and graphs. Explore linear relationships. **Solving linear equations** Understand what is meant by finding a solution to a linear	**Understanding multiplicative relationships: percentages and proportionality** Understand that multiplicative relationships can be represented in a number of ways and connect and move between those different representations. Understand that percentages are an	**Statistical representations, measures and analysis** Understand and calculate accurately measures of central tendency and spread. Construct accurate statistical representations. Interpret statistical measures and representations reasonably.	**Perimeter, area and volume** Understand the concept of perimeter and use it in a range of problem-solving situations. Understand the concept of area and use it in a range of problem-solving situations. Understand the concept of volume and use it in a range of problem-solving situations.	**Constructions** Use the properties of a circle in constructions. Use the properties of a rhombus in constructions.

	Understand the features of a sequence. Recognise and describe arithmetic sequences. recognise geometric sequences and appreciate other sequences that arise. TC4	equation with one unknown. Solve a linear equation with a single unknown on one side where obtaining the solution requires one step. Solve a linear equation with a single unknown where obtaining the solution requires two or more steps. Solve efficiently a linear equation with a single unknown involving brackets.	example of a multiplicative relationship and apply this understanding to a range of contexts. Tc12 Understand proportionality.	Choose appropriate statistical measures and representations.	**Geometrical properties: polygons** Understand and use angle properties.	
	N: 13,14 **A: 18,19,20**	**A; ,10,11,12,13**	**R6,R8, R9**			