YEAR 7 SCHEME OF WORK - EXTENSION

Autumn Term 1	Number Skills	Spring Term 1	Angles and Shape	Summer Term 1	Multiplicative Reasoning
	Analysing and displaying data		Decimals		Perimeter, Area and Volume
Half Term: Assessment		Half Term: Assessment		Half Term: Assessment	
Autumn Term 2	Equations, functions and Formulae	Spring Term 2	Equations	Summer Term 2	Sequences and Graphs
	Fractions				End of Term Assessment
End of Term: Assessment		End of Term: Assessment		End of Year: Assessment	

Year 7 Extension Term: Autumn 1	Unit Title: Number Skills	Duration: 11 hrs.
Objectives: • order positive and negative integers • use the concepts and vocabulary of prime numbers • use the concepts and vocabulary of factors (or divisors) • use the concepts and vocabulary of multiples • use the concepts and vocabulary of common factors • use the concepts and vocabulary of common multiples • use the concepts and vocabulary of highest common factor • use the concepts and vocabulary of lowest common multiple • use the four operations, including formal written methods, with positive and negative integers • use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals • use integer powers and associated real roots (square, cube and higher) • recognise powers of 2, 3, 4, 5	**Notes:** • Find factor pairs using any whole number • Find the HCF or LCM of 2 numbers less than 20 • Multiply and divide negative integers by a positive integer • Add and subtract integers – positive and negative integers • Add and subtract negative integers from positive and negative integers • Multiply and divide integers – positive and negative integers • Multiply and divide negative integers by a negative integer • Use index notation for squares and cubes and for positive integer powers of 10 • Know all the squares of numbers less than 16 and be able to find the square root given the square number • Give the positive and negative square root of a square number • Extend mental calculations to squares and square roots • Be able to estimate square roots of non square numbers less than 100 • Mentally be able to calculate the squares of numbers less than 16 multiplied by a multiple of ten (e.g. 0.2, 300, 0.400) • Divide three-digit by two-digit whole numbers • Using rounding to the nearest 10 or a nice number (e.g. 62 to 63 when dividing by 9 etc.) • Use mental strategies for multiplication – doubling and halving strategies • Checking by an inverse operation (questions other than four rules, e.g. square roots checked with squaring) • Be able to estimate answers to calculations involving 2 or more operations and BIDMAS • Use index notation for small integer powers (e.g. $3 \times 2^3 = 24$) • Extend mental calculations to cubes and cube roots • Extend calculations to cubes and cube roots using mental methods and a calculator when appropriate • Be able to find square roots by factorising • Be able to find cube roots by factorising • Be able to use mental strategies to solve word problems set in context using square roots and cubes roots mentally • Be able to work with calculations where the brackets are squared or square rooted • Combine laws of arithmetic for brackets with mental calculations of cubes and squares • Combine laws of arithmetic for brackets with mental calculations of square roots • Combine laws of arithmetic for brackets with mental calculations of cube roots and square roots • Understand which part of an expression is raised to a power by knowing the difference between $3 \times (7 + 8)^2$ and $3^2 \times (7 + 8)$ and $(3 \times (7 + 8))$	

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Year 7 Extension Term: Autumn 1	Unit Title: Analysing and Displaying data	Duration: 11 hrs.
Objectives: • describe, interpret and compare observed distributions of a single variable through: appropriate measures of central tendency (mean, mode, median) • construct and interpret frequency tables • construct and interpret bar charts • construct and interpret pie charts • construct and interpret vertical line (or bar) charts for ungrouped data • construct and interpret vertical line (or bar) charts for grouped numerical data • Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts • Illustrate simple mathematical relationships between two variables (bivariate data) using scatter graphs	**Notes/Common misconceptions:** • Compare two simple distributions using appropriate measures • Calculate the mean from a simple frequency table • Compare two distributions given summary statistics • Recognise when it is appropriate to use mean, median or mode • Use two way tables for discrete data • Make inferences about data through extracting information from a two way table • Construct and interpret pie charts and line graphs • Use questionnaire responses to complete a data collection sheet • Construct and interpret compound and dual (comparative) bar charts • Interpret and / or compare bar graphs and frequency diagrams which are misleading • Construct a simple frequency table with equal class intervals for continuous data • Be able to use > or < correctly between two positive decimals. Decimals should be to 4 or 5 significant figures. • Be able to use > or < correctly between two negative decimals. Decimals should be to 2 or 3 significant figures. • Construct a frequency table with given equal class intervals for continuous data (boundary data given) • Construct a frequency diagram from a grouped frequency table • Find the modal class of a set of continuous data • Construct line graphs for time series • Construct and interpret scatter graphs • Identify which graphs are the most useful in the context of the problem • Use correlation to describe relations between sets of data • Draw and use a line a best fit to estimate a missing value	

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Year 7 Extension Term: Autumn 2	Unit Title: Expressions, functions and formulae	Duration: 11 hrs.
Objectives: • use and interpret algebraic notation: ab in place of a × b • use and interpret algebraic notation: 3y in place of y + y + y and 3 × y • use and interpret algebraic notation: a2 in place of a × a • use and interpret algebraic notation: a3 in place of a × a × a • use and interpret algebraic notation: a2b in place of a × a × b • use and interpret algebraic notation: b/a in place of a ÷ b • use and interpret algebraic notation: brackets • substitute numerical values into formulae and expressions, including scientific formulae • understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors • simplify and manipulate algebraic expressions to maintain equivalence: collecting like terms • simplify and manipulate algebraic expressions to maintain equivalence: multiplying a single term over a bracket • simplify and manipulate algebraic expressions to maintain equivalence: taking out common factors • model situations or procedures by translating them into algebraic expressions or formula	**Notes/Common misconceptions:** • Simplify simple expressions by collecting like terms • Understand the difference between $2n$ and n^2 • Know that expressions involving repeated multiplication can be written as n, n^2, n^3 • Simplify simple expressions involving powers but not brackets, by collecting like terms • Construct expressions from worded description, using addition, subtraction and multiplication • Construct expressions from worded description, using all 4 basic operations • Express simple functions in symbols • Know that the contents of brackets are evaluated first when using algebra • Know that multiplication and division are carried out before addition and subtraction • Substitute positive integers into expressions involving small powers • Evaluate an expression by substituting a positive value into the expression x^2 • Use the distributive law to take out numerical common factors • Multiply a single term over a bracket • Add, subtract, multiply and divide integers – extend to the distributive law $a(b + c)$ • Substitute positive integers into simple formulae expressed in words • Substitute integers into more complex formulae expressed in letter symbols • Substitute positive integers into simple formulae expressed in letter symbols • Substitute integers into more complex formulae (involving brackets and more than one operation) expressed in letter symbols • Substitute positive and negative integers into simple formulae • Identify the unknowns in a formula and a function • Derive formulae expressed in letter symbols • Understand the different role of letter symbols in formulae and functions	

	• Derive complex algebraic expressions and formulae

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Year 7 Extension Term: Autumn 2	Unit Title: Fractions	Duration: 11 hrs.
Objectives: • order decimals and fractions • use the four operations, including formal written methods, with positive and negative fractions • use the four operations, including formal written methods, with positive and negative improper fractions and mixed numbers • define percentage as 'number of parts per hundred' • interpret percentages and percentage changes as a fraction or a decimal • express one quantity as a fraction of another, where the fraction is less than 1 • express one quantity as a fraction of another, where the fraction is greater than 1	**Notes/Common misconceptions:** • Use a diagram to compare two or more simple fractions • use < and > to compare fractions with same denominator, or unit fractions with different denominators • Simplify fractions by cancelling all common factors • Express one number as a fraction of another. The numbers should be very simple (halves, quarters, thirds) • Use fraction notation to express a smaller whole number as a fraction of a larger one • Begin to add and subtract simple fractions and those with simple common denominators • Add fractions by writing with a common denominator, where the denominators are 12 or less, where the answer is less than 1 • Understand that when two positive fractions are added the answer is larger than either of the original two fractions • Subtract fractions by writing with a common denominator, where the denominators are less than 12 and the first fraction is larger than the second • Understand that when two positive fractions are subtracted the answer is less than the first fraction but may still be larger than the second • Add and subtract simple fractions with denominators of any size • Check addition or subtraction of fractions with an inverse calculation • Add and subtract up to 3 fractions mixing both addition and subtraction into the calculation, with denominators less than or equal to 12 and the using the LCM denominator in the calculation – the answer can be a mixed number • Extend the possible fractions that can be used in mental calculations by using halving and doubling strategies • Calculate simple fractions of quantities and measurements (whole number answers) • Calculate fractions of quantities and measurements (fraction answers) • Multiply a fraction by an integer • Multiply an integer by a fraction	

	• Understand the effect of multiplying a positive number by a fraction less than 1 • Recall known facts including fraction to decimal conversions • Recall of equivalent fractions and decimals and percentage including for fractions that are greater than 1 • Use division to convert a fraction to a decimal • Use halving and doubling strategies on fractions to find decimal equivalents of other fractions • Interpret division as a multiplicative inverse. Know that 1 divided by 1/4 is the same as 1 × 4 • Divide an integer by a fraction • Understand the effect of dividing a positive number by a fraction less than 1 • Multiply a fraction by a fraction (without cancelling) • Cancel common factors before multiplying fractions • Divide a fraction by a fraction • Add mixed number fractions without common denominators, where the fraction parts add up to more than 1 • Be able to enter time as a mixed number into a calculator • Subtract mixed number fractions when the fractional part of the first fraction is all that is required for the calculation to take place • Subtract mixed number fractions where the whole number part of the first fraction needs to be broken down to complete the calculation • Multiply a fraction by a mixed number • Divide a mixed number by a fraction

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Year 7 Extension Term: Spring 1	Unit Title: Angles and Shapes	Duration: 9 hrs.
Objectives: • apply the properties of angles at a point • apply the properties angles at a point on a straight line • apply the properties vertically opposite angles • understand and use the relationship between parallel lines and alternate and corresponding angles • derive and use the sum of angles in a triangle • use the sum of angles in a triangle to deduce the angle sum in any polygon • derive properties of regular polygons	**Notes:** • Solve simple geometrical problems showing reasoning • Recognise and use vertically opposite angles • Identify alternate angles • Identify corresponding angles • Identify alternate and corresponding angles on the same diagram • Calculate angles in a triangle • Solve geometric problems using side and angle properties of equilateral and isosceles triangles • Understand a proof that the sum of the angles of a triangle is 180 degrees • Understand a proof that the exterior angle of a triangle is equal to the sum of the two interior opposite angles • Identify all the symmetries of 2D shapes • Identify and begin to use angle, side and symmetry properties of quadrilaterals • Find co-ordinates of points determined by geometric information • Classify quadrilaterals by their geometric properties • Understand a proof that the sum of the angles of a quadrilateral is 360 degrees • Explain how to find the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons • Calculate the interior and exterior angles of regular polygons • Use the interior and exterior angles of regular and irregular polygons	

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Year 7 Extension Term: Spring 1	Unit Title: Decimals	Duration: 11 hrs.
Objectives: • understand and use place value for decimals • understand and use place value for integers • order decimals and fractions • use the symbols =, ≠, <, >, ≤, ≥ • work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8) • interpret percentages and percentage changes as a fraction or a decimal • interpret percentages multiplicatively • express one quantity as a percentage of another • compare two quantities using percentages • work with percentages greater than 100% • interpret fractions and percentages as operators • use standard units of mass, length, time, money and other measures, including with decimal quantities • use approximation through rounding to estimate answers • solve problems involving percentage change: percentage increase • solve problems involving percentage change: decrease • solve problems involving percentage change: original value problems • solve problems involving percentage change: simple interest in financial mathematics	**Notes/Common misconceptions:** • Order positive decimals as a list with the smallest on the left. Decimals should be to 4 or 5 significant figures • Order negative decimals as a list with the smallest on the left • Order positive decimals with the largest on the left. Decimals should be to 4 or 5 significant figures • Order negative decimals as a list with the smallest on the left. Decimals should be to 2 or 3 significant figures • Order negative decimals with the largest on the left. Decimals should be to 2 or 3 significant figures • Use > or < correctly between two positive decimals. Decimals should be to 4 or 5 significant figures. • Use > or < correctly between two negative decimals. Decimals should be to 2 or 3 significant figures • Round numbers to two or three decimal places • Write numbers as a decimal number of millions or thousands e.g. 23 600 000 as 23.6 million • Round to an appropriate number of decimal places after calculations, e.g. money problems after division, perimeter when using the pi key and a radius in cm etc. • Work with numbers rounded to whole numbers or to 1 or two decimal places to estimate solutions, e.g. average populations of cities under certain effects. • Add and subtract more than two integers or decimals with up to two decimal places, but with varying numbers of significant figures and using a mixture of operations within the calculation • Use standard column procedures to add and subtract integers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places • Subtract integers and decimals with up to two decimal places, but with varying numbers of significant figures • Extend written methods to U.t × U • Multiply and divide decimals with one or two places by single-digit whole numbers	

	• Use mental strategies for multiplication - partitioning two 2 digit numbers where one number includes a decimal (both numbers have two significant figures) • Multiply integers and decimals including by decimals such as 0.6 and 0.06, 0.t × 0.t or 0.t × 0.0h, 0.0h × 0.t and 0.0h × 0.0h • Multiply and divide by decimals, dividing by transforming to division by an integer • Understand the effect of multiplying a positive number by a decimal less than 1 • Use mental strategies for multiplication of decimals - doubling and halving strategies • Understand where to position the decimal point by considering equivalent calculations which are given • Use knowledge of place value to calculate the product of two decimals where one or both are less than 1 and at least one has two digits other than zero • Multiply any number by 0.1 and 0.01 • Know there are different ways of finding an approximate answer • Divide integers and decimals including by decimals such as 0.6 and 0.06 divisions related to 0.t × 0.t or 0.t × 0.0h, 0.0h × 0.t and 0.0h × 0.0h • Use knowledge of place value to calculate the division of two decimals where both are less than 1 and at least the first has two digits other than zero • Multiply and divide by decimals, dividing by transforming to division by an integer • Divide £.p by a two digit number to give £.p • Multiply and divide decimals with one or two places by single-digit whole numbers • Divide decimals with one or two places by single-digit whole numbers • Understand that dividing by 0.1 or 0.01 are equivalent to dividing by 1/10th or 1/100th or multiplying by 10 or 100 • Divide any number by 0.1 and 0.01 • Know there are different ways of finding an approximate answer

	• Recall of equivalent fractions, decimals and percentage including for fractions that are greater than 1. Match across all 3 types, and need to be simple fractions (1/2, 1/4, 1/5, 1/10) • Use the equivalence of fractions, decimals and percentages to compare proportions • Find equivalent fractions, decimals and percentages where percentages end in 0.5 • Use strategies for finding equivalent fractions, decimals and percentages involving decimal percentages and decimals greater 0 • Order fractions by converting them to decimals or otherwise • Simplify converted terminating decimal to fraction convert a terminating decimal to a fraction and simplify the fraction • Write terminating decimals as fractions • Interpret rounded off recurring decimals displayed on a calculator as fractions – 2/3, 1/6, 1 2/3, 1 1/6 • Convert terminating decimals to fractions really means like 0.745 = 745/1000, not 0.5 = 1/2 • Extend the percentage calculation strategies with jottings to find any percentage • Express one given number as a percentage of another • Find the outcome of a given percentage increase • Find the outcome of a given percentage decrease • Use a unitary method • Have strategies for calculating fractions and decimals of a given number

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Year 7 Extension Term: Spring 2	Unit Title: Equations	Duration: 9 hrs.
Objectives: • rearrange formulae to change the subject • use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)	**Notes/Common misconceptions:** • Solve simple linear equations with integer coefficients, of the form $ax = b$ or $x +/- b = c$ e.g. $2x = 18$, $x + 7 = 12$ or $x - 3 = 15$ • Solve simple two-step linear equations with integer coefficients, of the form $ax + b = c$ e.g. $3x + 7 = 25$ • Substitute integers into formulae to give equations and solve • Solve linear equations of the form $ax +/- b = cx +/- d$ • Solve equations of the form $a(x +/- b) = c(x +/- d)$ [a or c can be 1] • Find a positive and negative square root as a solution of an equation involving x^2 • Construct and solve equations of the form $a(x +/- b) = c(x +/- d)$ [a or c can be 1] • Use systematic trial and improvement to find the approximate solution to one decimal place of equations such as $x^3 + x = 50$	

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Year 7 Extension Term: Summer 1	Unit Title: Multiplicative Reasoning	Duration: 11 hrs.
Objectives: • use ratio notation • reduce a ratio to simplest form • divide a given quantity into two parts in a given part: part ratio • divide a given quantity into two parts in a given 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 • relate the language of ratios and the associated calculations to linear functions	**Notes/Common misconceptions:** • Reduce a ratio to its simplest form • Reduce a three part ratio to its simplest form by cancelling • Simplify a ratio expressed in fractions or decimals • Convert between larger area measures to smaller ones (e.g. cm^2 to mm^2) • Increase the knowledge of standard metric units to include tonne, hectare • Simplify a ratio expressed in different units • Compare ratios by changing them to the form 1:m or m:1 • Divide a quantity into two parts in a given ratio, where ratio given in ratio notation • Divide a quantity into more than 2 parts in a given ratio • Write ratios as fractions, percentages • Understand the relationship between ratio and proportion (convert proportions to ratios) • Solve word problems involving direct proportion • Use the unitary method to solve simple word problems involving ratio and direct proportion • Relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions	

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Year 7 Extension Term: Summer 1	Unit Title: Perimeter, Area and Volume	Duration 11hrs
Objectives: • understand and use place value for measures • use standard units of mass, length, time, money and other measures, including with decimal quantities • round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] • understand and use standard mathematical formulae • change freely between related standard units [for example time, length, area, volume/capacity, mass] • derive formulae to calculate and solve problems involving perimeter of triangles, parallelograms, trapezia • derive and apply formulae to calculate and solve problems involving area of triangles, parallelograms, trapezia • derive and apply formulae to calculate and solve problems involving volume of cuboids (including cubes) • calculate and solve problems involving 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	**Notes/Common misconceptions:** • Find the area of triangles by counting i.e. adding full and partial squares • Use a formula to calculate the area of triangles • Deduce a formula for the area of a triangle • Use a formula to calculate the area of parallelograms • Deduce and use the formula for the area of a parallelogram • Deduce a formula for the area of a trapezium • Calculate the area of more complex shapes made from rectangles • Calculate the perimeter and area of shapes made from rectangles • Calculate areas of compound shapes made from rectangles and triangles • Know and use geometric properties of cuboids • Identify more complex nets of 3D shapes including irregular polyhedra • Know and use geometric properties of shapes made from cuboids • Know and use the formula for the volume of a cuboid • Calculate volumes of shapes made from cuboids, for lengths given as whole numbers • Calculate the surface area of cubes, without a net • Use nets to calculate the surface area of simple cuboids • Calculate the surface area of simple cuboids (without use of nets) • Calculate surface areas of shapes made from cuboids, for lengths given as whole numbers • Convert cm^3 to m*l* and litres and vice versa • Convert between area measures (e.g. mm^2 to cm^2, cm^2 to m^2, and vice versa) • Convert between volume measures (e.g. mm^3 to cm^3, cm^3 to m^3, and vice versa) • Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons)	

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Year 7 Extension Term: Summer 2	Unit Title: Sequences and Graphs	Duration: 10 hrs.
Objectives: • appreciate the infinite nature of the sets of integers, real and rational numbers • generate terms of a sequence from a term-to-term rule • generate terms of a sequence from a position-to-term • recognise arithmetic sequences • find the nth term • recognise geometric sequences and appreciate other sequences that arise	**Notes/Common misconceptions:** • Understand the infinite nature of a set of integers • Know that an arithmetic sequence is generated by a starting number *a*, then adding a constant number *d* • Generate terms of a linear sequence using term to term using positive or negative integers • Find a term given its position in a sequences like 10^{th} number in 4× table is 40 (one operation on *n*) • Recognise geometric sequences and other sequences that arise. • Begin to use a linear expression to describe the *n*th term in a one-step arithmetic sequence • Generate terms of a linear sequence using position to term with positive integers using the *n*th term. • Begin to use linear expressions to describe the nth term in a two step arithmetic sequence (e.g *n*th term is $3n + 1$ or $2n - 3$) • Generate terms of a linear sequence using position to term with negative integers • Begin to use formal algebra to describe the *n*th term in an arithmetic sequence • Generate and describe integer sequences such as powers of 2 and growing rectangles • Generate terms from a complex practical context (e.g maximum crossing for a given number of lines) • Predict how the sequence will continue and test for several more terms. • Find the term-to-term rule for geometric sequences and continue to the next few terms • Read *x* and *y* co-ordinates in all four quadrants • Plot a coordinate in all four quadrants • Know how to find the midpoint of a line segment • Recognise straight line graphs parallel to *x* or *y* axis • Find the midpoint of a horizontal or vertical line segment AB, using coordinates of these points (no diagrams) • Find the midpoint of a diagonal line segment AB using the coordinate of these points (no diagrams) • Plot a graph of a simple linear function in the first quadrant.	

	• Compare graphs of simple functions • Generate four quadrant coordinate pairs of simple linear functions • In tables of functions compare changes in y with corresponding changes in x and how this relates to the function • Plot and recognise graphs of $y = x$ and $y = -x$ • Plot the graphs of simple linear functions in the form $y = mx + c$ in four quadrants

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