## Year 8 - Mathematics

|  | **HT1****NUMBER** | **HT2****ALGEBRIC THINKING**  | **HT3****GEOMETRY & ANGLES & COORDINATES** | **HT4****RATIO & PROPORTION** | **HT5****PROBABILITY & NUMBER** | **HT6****STATISTICS** |
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| Learning outcomes/ composite knowledge:Pupils will be able to… | **LO1: Number Sense**To consolidate number fluency and solve problems using number sense**LO2 Solving Problems****with Addition and****Subtraction.**To solve problems withaddition and subtraction **LO3: Solving Problems****with Multiplication and Division** To solve problems withMultiplication anddivision.**LO4: BIDMAS/BODMAS**To solve problems using BIDMAS/BODMAS | **LO1: Brackets,****Equations and Inequalities** To improve knowledge and understanding of working with brackets, equations and inequalities **LO2: Sequences.**To generate sequences when given a rule **LO3: Indices** To explore powers using the index laws | **LO1 Measuring Angles**To be able to name and measure angles**LO2: Finding unknown****Angles.**Use angle rules to find missing angles at a point, around intersecting lines, between parallel lines and in triangles and quadrilaterals.**LO3: 3D shapes & Nets**To recognise and drawnets of 3D shapes;To find the volume ofprisms **LO4: Perimeter & Area of Triangles,****Parallelograms &****Trapeziums**Find the area and perimeter of a rectangle, triangle, parallelogram and trapezium.**LO5: Parts of a Circle, Circles**To name all parts of a circle.To find the circumference and area of a circle.To be able to find thearea of compositeshapes involving circles.**LO6: Co-ordinates.**Find and plotcoordinates on a grid with four quadrants, | **LO1: Ratio and Scale** To work with ratio and scale**LO2: Multiplicative Change**To understand multiplicative change **LO3: Multiplying and Dividing Fractions** To apply the rules of multiplying and dividing fractions.**LO4: Ratio and Fractions.**To calculate and problem solve with ratios and fractions | **LO1: Probability Scale**To calculate probabilities.**LO2: Basic Probability**To draw sample space diagrams and use them to find probabilities.**LO3: Decimals up to 2 d.p.**To add, subtract, multiply and divide decimals.**LO4: Multiply by 10, 100, 1000.**To multiply integers and decimals by multiples of 10**LO5: Divide by 10, 100, 1000.**To divide integers and decimals by multiples of 10**LO6: Percentages**Find the percentage of a number.Calculate percentage increases and decreases.**LO7: Decimals as Fractions**Convert between fractions, decimals and percentages. Compare proportions of amounts. | **LO1: Correlation**To understand correlation; plot scatter diagrams and lines of best fit**LO2: Pie chart.**To be able to draw andinterpret a pie chart.Find fractions and percentages of a pie chart.**LO3: Diagrams**.To be able to complete, pictograms, block diagrams, Bar charts and two way tables.**LO4:Mode, Median, Mean & Range**To find the range, mode, median and mean of a set of data, and use them to compare data sets |
| Knowledge Components | Declarative knowledge | **LO1: Number Sense**I know what rounding means;I know what significant figures are;I know what estimate means;I know what the order of operations is;I know what the metric units of weight and capacity are.**LO2, LO3: Solving Problems****with Addition,** **Subtraction, Multiplication and Division.**I know what the properties of addition and subtraction and multiplication and division are;I know what factors and multiples are;**LO4: BIDMAS/BODMAS**I know the mathematic conventions for the order of operations | **LO1: Brackets, Equations and Inequalities** I know what inequalities are.I can identify formulae, expressions, identities and equations **LO2: Sequences.**I know what a sequence is.I know what linear and numerical mean.I know the difference between linear and non-linear sequences**LO3: Indices** I know what the concept of powers and roots mean;I know what the addition and subtraction law for indices is | **LO1 Measuring Angles**I can describe an angle using mathematical language.**LO2: Finding unknown angles.**I know rules for angles in a rectangle, triangle, quadrilateral, on aline and around a point;I know rules for angles in parallel lineswith a transversal**LO3: 3D shapes & Nets**I know the mathematical names forcommon 3D shapesI know what a mathematical net is.**LO4: Perimeter & Area of Rectangles,****Triangles, Parallelograms &****Trapeziums**I know the difference between perimeterand area;I know formulas for area of a rectangle,triangle, parallelogram and trapeziumand understand how they are derived;**LO5: Parts of a Circle, Circles**I can label the parts of a circle;I know the formulae for the circumference and area of a circle;**LO6: Co-ordinates;**I know how to read and interpret a co-ordinate in all 4 quadrants | **LO1: Ratio and Scale.**I understand the meaning and representation of ratio and ratio notation;**LO2: Multiplicative Change.**I understand scale factors as multiplicative representations**LO3: Multiplying and Dividing Fractions**I know what product means;I know what a reciprocal is; | **LO1: Probability Scale**I know that probabilities are between 0 and 1;I know that probabilities add up to 1;**LO2: Basic Probability**I am familiar with the detail of different contexts used for probability eg playing cards**LO3: Decimals up to 2 d.p**I know the rules for adding, subtracting, multiplying and dividing with decimals**LO4: Multiply by 10, 100, 1000.**I know the rules of multiplying by multiples of 10**LO5: Divide by 10, 100, 1000.**I know the rules of dividing by multiples of 10**LO6: Percentages**I can give real life examples of percentage increases/decreases**LO7: Decimals as Fractions**I know simple conversions of fractions to decimals and percentages | **LO1: Correlation**I know what positive and negative correlation is;I know what a line of best fit is;**LO2: Pie chart.** I know what different portions of a pie chart represent;**LO4: Mode, Median, Mean & Range.**I know the difference between the measures of central tendency;I know the difference between measures of central tendency and the range |
| Procedural knowledge | **LO1: Number Sense**I can round numbers using decimal places;I can round numbers using significant figures; I can find estimates to calculations;I know what the order of operations is.I know what the metric units of weight and capacity are**LO2, LO3 Solving Problems****with Addition,** **Subtraction, Multiplication and Division.**I can usemental strategies for addition and subtraction.I can useInformal and formal methods for addition of integers and decimalsI know how to use informal and formal methods for subtraction of integers and decimalsI can use informal and formal methods for multiplication and division of integers and decimals. I know how to solve financial maths problems I can calculatefactors and multiples;I know how to multiply and divide integers and decimals by powers of 10I know how to convert metric measuresI know how to use formal methods to multiply integers and decimals.I know how to use formal methods to divide integers and decimals.I know how to use order of operations to find accurate answers;**LO4: BIDMAS/BODMAS**I can accurately undertake calculations using mathematical conventions; | **LO1: Brackets, Equations and Inequalities**I know how to form algebraic expressions ;I can use directed number with algebra;I know how to multiply out a single bracket;I know how to factorise into a single bracket;I know how to expand multiple single brackets and simplify;I know how to solve equations, including with brackets;I know how to form and solve inequalities;I know how to solve formulae, expressions, identities and equations **LO2: Sequences**I know how to generate sequences given a rule in words or simple algebra**LO3: Indices** I can evaluate powers and roots;I know how to add and subtract expressions with indicesI know how to simplify algebraic expressions by multiplying and dividing indices;I know how to use the addition and subtraction law for indices | **LO1 Measuring Angles**I can use a protractor to measure angles,including reflex angles.**LO2: Finding unknown angles.**I can calculate missing angles and give reasons why using mathematical language**LO3: 3D shapes & Nets**I can look at a mathematical net andvisualise what 3D shape it would makeI can draw nets of common 3D shapes;I can calculate the volume of a prism;**LO4: Perimeter & Area of Rectangles,****Triangles, Parallelograms &****Trapeziums**I can calculate perimeters and areas of shapes including in problem solving contexts;I can calculate areas of composite shapes;**LO5: Parts of a Circle, Circles**I can calculate the area and circumference of a circle;**LO6: Co-Ordinates.**I can use my knowledge of symmetry to find missing co-ordinates in all 4 quadrants. | **LO1: Ratio and Scale**I know how to solve problems involving ratios of the for 1:n and n:1;I know how to divide a value into a given ratio;I know how to express ratios in their simplest integer form;I know how to compare ratios and related fractions;**LO2: Multiplicative Change**I know how to solve problems involving direct proportion;I can explore relationships between similar shapes;**LO3: Multiplying and Dividing Fractions.**I know how to represent multiplication of fractions and I know how to multiply a fraction by an integer;I know how to find the product of a pair of fractions;I know how to divide an integer/fraction by a fraction;I know how to use the reciprocal when dividing fractions;I know how to divide any pair of fractions | **LO1, LO2: Basic Probability**I can calculate simple probabilities;**LO3: Decimals up to 2 d.p**To can add, subtract, multiply and divide with decimals;**LO4: Multiply by 10, 100, 1000.**I can multiply integers and decimals by multiples of 10**LO5: Divide by 10, 100, 1000.**I can divide integers and decimals by multiples of 10**LO6: Percentages**I can calculate the multiplier for a percentage increase/decrease;I can calculate percentage increases/decreases using mental methods and a calculator**LO7: Decimals as Fractions**I can covert between fractions, decimals and percentages mentally or when appropriate, using a calculator |  **LO1: Correlation**I can use mathematical terminology to describe correlation;I can draw a scatter diagram;**LO2: Pie chart.** I can draw andinterpret a pie chart.I can find fractions and percentages of a pie chart.**LO3: Diagrams**. I can draw pictograms, block diagrams, bar charts and two way tables.**LO4: Mode, Median, Mean & Range.**I can calculate the mean, median and mode of a set of data;I can calculate the range of a set of data; |
| Contextual Knowledge | **LO1: Number Sense**I can make a sensible choice about the appropriate level of accuracy needed based on the given context;I can choose appropriate units of measurement based on the context of the problem;**LO2: Number Sense**I can make an accurate decision on the most appropriate method to use eg., mental strategies, informal/formal written or calculator; | **LO1, LO2. LO3: Algebraic thinking**I can make appropriate uses of algebraic methods to help me solve problems | **LO2: Finding unknown angles.**I can make use of a variety of angle facts to calculate missing angles; **LO4, LO5: Perimeter & Area of Rectangles,****Triangles, Parallelograms &****Trapeziums and Circles** Given a context, I can recognise shapes and use my knowledge and understanding of area and perimeter to solve problems; | **LO1: Ratio and Scale**I know how to solve proportional problems involving the ratio m:n**LO4: Ratio and Fractions.**To calculate and problem solve with ratios and fractions depending on the context given; | **LO3: Decimals up to 2 d.p**Given a problem, I can make an appropriate choice of operation needed to solve the problem;**LO6: Percentages**I can make an appropriate choice of whether to use a mental or calculator method with problems involving percentage increases/decreases;**LO7: Decimals as Fractions**I can use simple conversions of fractions to decimals and percentages to help work out answers mentally;I know how to convert my answer to the form (FDP) that it was given in;I can make an appropriate choice of whether it is best to preform a calculation mentally or using a calculator; | **LO1: Correlation**I can draw a line of best fit on a scatter diagram and use it to answer statistical questions;**LO3: Diagrams**. I can decide on an appropriate graphical representation of data**LO4: Mode, Median, Mean & Range**I know which is the best average to use for different contexts;I can discuss the limitations of different measures of central tendency;I can compare sets of data using mathematical terminology; |
| National Curriculum reference  | Select and use appropriate calculation strategies to solve increasingly complex problems; Extend their understanding of the number system; make connections between number relationships, and their algebraic and graphical representations; 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; Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals;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; Round numbers and measures to an appropriate degree of accuracy;Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation *a*<*x*≤*b ;*Appreciate the infinite nature of the sets of integers, real and rational numbers; Change freely between related standard units [for example time, length, area, volume/capacity, mass]; Use a calculator and other technologies to calculate results accurately and then interpret them appropriately | Use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships; Select and use appropriate calculation strategies to solve increasingly complex problems;Substitute values in expressions, rearrange and simplify expressions, and solve equations;Move freely between different numerical, algebraic, graphical and diagrammatic representations; Develop algebraic and graphical fluency, including understanding linear and simple quadratic functions; Use language and properties precisely to analyse numbers, algebraic expressionsextend their understanding of the number system; Make connections between number relationships, and their algebraic and graphical representations; Identify variables and express relations between variables algebraically; Make and test conjectures about patterns and relationships; look for proofs or counter- examples ;Begin to reason deductively in geometry, number and algebra, including using geometrical constructions; Use and interpret algebraic notation, including*ab* in place of *a* × *b*3*y* in place of *y* + *y* + *y* and 3 × *y**a*2 in place of *a* × *a*, *a*3 in place of *a* × *a* × *a*; *a*2*b* in place of *a* × *a* × *b**a* in place of *a*  *b*coefficients written as fractions rather than as decimalsbrackets;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 by collecting like termsmultiplying a single term over a brackettaking out common factorsexpanding 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;Use algebraic methods to solve linear equations in one variable; Interpret mathematical relationships both algebraically and graphically;Generate terms of a sequence from either a term-to-term or a position-to-term rule; Recognise arithmetic sequences and find the *n*th term; Recognise geometric sequences and appreciate other sequences that arise; | Move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs];Use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes;Extend and formalise their knowledge of ratio and proportion in working with measures and geometry;Begin to reason deductively in geometry, number and algebra, including using geometrical constructions;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;Solve problems involving direct and inverse proportion, including graphical and algebraic representations; 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); Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes; Draw and measure line segments and angles in geometric figures, including interpreting scale drawings;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; 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 enlargement, with and without coordinate grids; 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;Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D; Interpret mathematical relationships both algebraically and geometrically; | Use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships; Select and use appropriate calculation strategies to solve increasingly complex problems; Move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs];Extend their understanding of the number system; make connections between number relationships, and their algebraic and graphical representations; Extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically; Identify variables and express relations between variables algebraically and graphically;Make and test conjectures about patterns and relationships; look for proofs or counter- examples ; Begin to reason deductively in geometry, number and algebra, including using geometrical constructions; Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning;Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative; Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals; Recognise and use relationships between operations including inverse operations;Work interchangeably with terminating decimals and their corresponding fractions; Change freely between related standard units [for example time, length, area, volume/capacity, mass; Use scale factors, scale diagrams and maps; Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1;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; | Select and use appropriate calculation strategies to solve increasingly complex problems; Move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs];Extend their understanding of the number system; make connections between number relationships, and their algebraic and graphical representations;Make and test conjectures about patterns and relationships; look for proofs or counter- examples ;Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning; 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; 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 ;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; | Use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics;Identify variables and express relations between variables algebraically and graphically; Make and test conjectures about patterns and relationships; look for proofs or counter- examples ;Explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally;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 experimental contexts and illustrate using scatter graphs; |
| Develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems;Develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics;Begin to model situations mathematically and express the results using a range of formal mathematical representations;Select appropriate concepts, methods and techniques to apply to unfamiliar and non- routine problems. |