Curriculum Area: Maths **Year:** 8
2015/2016

Topics	Year Curriculum	How you can support learning at home, eg. Books, websites, family learning through visits.
Module 1 Number	***Term 1: Number Operations*** ●● understand and use the rules of arithmetic and inverse operations in the context of integers and fractions ●● use the order of operations, including brackets, with more complex calculations ●● recall equivalent fractions, decimals and percentages; use known facts to derive unknown facts, including products involving numbers such as 0.7 and 6, and 0.03 and 8 ●● strengthen and extend mental methods of calculation, working with decimals, fractions, percentages, squares and square roots, cubes and cube roots; solve problems mentally ●● make and justify estimates and approximations of calculations ●● use efficient written methods to add and subtract integers and decimals of any size, including numbers with differing numbers of decimal places ●● use efficient written methods for multiplication and division of integers and decimals, including by decimals such as 0.6 or 0.06; understand where to position the decimal point by considering equivalent calculations ●● carry out more difficult calculations effectively and efficiently using the function keys for sign change, powers, roots and fractions; use brackets and the memory ●● enter numbers and interpret the display in different contexts (extend to negative numbers, fractions, time) ●● select from a range of checking methods, including estimating in context and using inverse operations **recognise and use relationships between operations including inverse operations** ***Term 1: Place value, ordering and rounding*** ●● understand and use place value for decimals, measures and integers of any size ; multiply and divide integers and decimals by 0.1, 0.01 ●● order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥	BBC Bitesize KS3 website My maths: **online lessons** , **online homeworks** and **booster packs** Nrich Maths: http://nrich.maths.org/teacher-secondary

	●● 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** **use a calculator and other technologies to calculate results accurately and then interpret them appropriately** **use standard units of mass, length, time, money and other measures, including with decimal quantities** **appreciate the infinite nature of the sets of integers, real and rational numbers** ***Term 1: Fraction decimals and percentages*** ●● recognise that a recurring decimal is a fraction; use division to convert a fraction to a decimal; work interchangeably with terminating decimals and their corresponding fractions (such as $\frac{7}{2}$ as 3.5 and or 0.375 and $\frac{3}{8}$) Percentages order fractions by writing them with a common denominator or by converting them to decimals ●● add and subtract fractions by writing them with a common denominator; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction ●● Define percentage as 'number of parts per hundred', interpret percentage as the operator 'so many hundredths of' and express one given number as a percentage of another; calculate percentages and find the outcome of a given percentage increase or decrease interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively,	

	Compare 2 quantities using percentages, and work with percentages greater than 100%. **interpret fractions and percentages as operators** ***Term 2: Integers, powers and roots*** ●● add, subtract, multiply and divide integers ●● use multiples, factors, common factors, highest common factors, lowest common multiples and primes; find the prime factor decomposition of a number, e.g. 8000 = $2^6 \times 5^3$ **●● 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 10n 1≤A<10, where n is a positive or negative integer or 0.** ***Term 3: Ratio and proportion*** change freely between related standard units use scale factors, scale diagrams and maps express 1 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 2 parts in a given part: part or part: whole ratio; express the division of a quantity into 2 parts as a ratio **understand that a multiplicative relationship between 2 quantities can be expressed as a ratio or a fraction (Multiplicative reasoning** **is a big focus of new curriculum)** relate the language of ratios and the associated calculations to the arithmetic of fractions and to	

	linear functions solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics solve problems involving direct and inverse proportion, including graphical and algebraic representations use compound units such as speed, unit pricing and density to solve problems	
Module 2 Algebra	***Term 1: Equations, formulae, identities and expressions*** ●● recognise that letter symbols play different roles in equations, formulae and functions; know the meanings of the words *formula* and *function* ●● understand that algebraic operations, including the use of brackets, follow the rules of arithmetic; use index notation for small positive integer powers ●●use and interpret algebraic notation, including: ab in place of a × b 3y 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^2b in place of a × a × b, $\frac{a}{b}$ in place of a ÷ b ●● simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket ●● construct and solve linear equations with integer coefficients (unknown on either or both sides, without and with brackets) using appropriate methods (e.g. inverse operations, transforming both sides in same way) ●● use graphs and set up equations to solve simple problems involving direct proportion ●● use formulae from mathematics and other subjects; substitute integers into simple formulae, including examples that lead to an equation to solve; substitute positive integers into expressions involving small powers, e.g. 3*x*2 +4 or 2*x*3; derive simple formulae ●●Coefficients written as fractions rather than as decimals brackets	CGP Ks3 revision Guides and work book available from most good book shops.

	Term 2: Sequences, functions and graphs ●● generate terms of a linear sequence using term-to-term and position-to term rules, on paper and using a spreadsheet or graphics calculator **●●recognise geometric sequences and appreciate other sequences that arise** ●● use linear expressions to describe the *n*th term of a simple arithmetic sequence, justifying its form by referring to the activity or practical context from which it was generated ●● express simple functions algebraically and represent them in mappings or on a spreadsheet ●● generate points in all four quadrants and plot the graphs of linear functions, where *y* is given explicitly in terms of *x*, on paper and using ICT; recognise that equations of the form *y=mx+c* correspond to straight-line graphs ●● construct linear functions arising from real-life problems and plot their corresponding graphs; discuss and interpret graphs arising from real situations, e.g. distance–time graphs. model situations or procedures by translating them into algebraic expressions or formulae and by using graphs **●●Recognise, sketch and produce graphs of linear and quadratic functions of 1 variable with appropriate scaling, using equations in x and y and the Cartesian plane.** **●●interpret mathematical relationships both algebraically and graphically** **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** **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** **●●find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs**	

Module 3 Shape and space **Loci and bearings have been removed** **A change of emphasis: constructing becomes measuring**	***Term 1: Angles rules and properties of shapes*** ●● identify alternate angles and corresponding angles; **understand and use the relationship between parallel lines and alternate and corresponding angles**; understand a proof that: – the angle sum of a triangle is 180° and of a quadrilateral is 360° – the exterior angle of a triangle is equal to the sum of the two interior opposite angles ●●apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles **●●derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures using appropriate language and technologies** **●●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** **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 Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles.** ●● solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometrical properties ●● know that if two 2-D shapes are congruent, corresponding sides and angles are equal ●● visualise 3-D shapes from their nets; use geometric properties of cuboids and shapes made from cuboids; use simple plans and elevations **use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D** ***Term 2: Measures & Mensuration*** ●● choose and use units of measurement to measure, estimate, calculate and solve problems in a range of contexts; know rough metric equivalents of imperial measures in common use, such as miles, pounds (lb) and pints ●● use bearings to specify direction ●● derive and use formulae for the area of a triangle, parallelogram and trapezium; calculate areas of compound shapes	**SATs Online Practice** Practice KS3 assessments online Levels 3-5 paper 1, paper 2 Levels 4-6 paper 1, paper 2 Levels 5-7 paper 1 , paper 2 Levels 6-8 paper 1 , paper 2

	●● know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids and shapes made from cuboids ***Term 2: Coordinates and transformations*** ●● identify all the symmetries of 2-D shapes ●● transform 2-D shapes by rotation, reflection and translation, on paper and using ICT ●● try out mathematical representations of simple combinations of these transformations ●● understand and use the language and notation associated with enlargement; enlarge 2-D shapes, given a centre of enlargement and a positive integer scale factor; explore enlargement using ICT ●● make scale drawings ●● find the midpoint of the line segment AB, given the coordinates of points A and B ***Term 3: Loci and constructions*** draw and measure line segments and angles in geometric figures, including interpreting scale drawings ●● use straight edge and compasses to construct: – the midpoint and perpendicular bisector of a line segment – the bisector of an angle – the perpendicular from a point to a line – the perpendicular from a point on a line **recognise and use the perpendicular distance from a point to a line as the shortest distance to the line.** – a triangle, given three sides (SSS) ●● use ICT to explore these constructions ●● find simple loci, both by reasoning and by using ICT, to produce shapes and paths, e.g. an equilateral triangle **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 **identify and construct congruent)triangles, and construct similar shapes by enlargement, with and without coordinate grids**	
Module 4 Handling data **NO PROBABILITY IN KS2**	***Term 1: Probability*** ●● interpret the results of an experiment using the language of probability; appreciate that random processes are unpredictable ●● know that if the probability of an event occurring is *p*, then the probability of it not occurring is 1 – *p* ; use diagrams and tables to record in a systematic way all possible mutually exclusive outcomes for single events and for two successive events ●● compare estimated experimental probabilities with theoretical probabilities, recognising that: – if an experiment is repeated the outcome may, and usually will, be different – increasing the number of times an experiment is repeated generally leads to better estimates of 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 **●●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 ***Term 2: Processing & Representing data*** ●●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) ●● calculate statistics for sets of discrete and continuous data, including with a calculator and	**The Maths eBook of Notes and Examples** is a fantastic, free, comprehensive set of revision notes and worked examples for students.

	spreadsheet; ●● 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. Construct graphical representations, on paper and using ICT, and identify which are most useful in the context of the problem. Include: – pie charts for categorical data – ●●describe simple mathematical relationships between 2 variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs; bar charts and frequency diagrams for discrete and continuous data – simple line graphs for time series – simple scatter graphs – stem-and-leaf diagrams ***<u>Term 2: Interpreting & Discussing Data</u>*** ●● interpret tables, graphs and diagrams for discrete and continuous data, relating summary statistics and findings to the questions being explored ●● compare two distributions using the range and one or more of the mode, median and mean ●● write about and discuss the results of a statistical enquiry using ICT as appropriate; justify the methods used ***<u>Term 3: Planning data</u>*** ●● discuss a problem that can be addressed by statistical methods and identify related questions to explore ●● decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources; consider appropriate sample size ●● plan how to collect the data; construct frequency tables with equal class intervals for gathering continuous data and two-way tables for recording discrete data ●● collect data using a suitable method (e.g. observation, controlled experiment, data logging using ICT)	
Module 5 Using and applying Mathematics	Through the mathematics content, pupils should be taught to: **Develop fluency**	Assessment: Every half term a topic based or optional test is taken. End of every term the year group will complete

Working mathematically	consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots select and use appropriate calculation strategies to solve increasingly complex problems use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships substitute values in expressions, rearrange and simplify expressions, and solve equations move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs] develop algebraic and graphical fluency, including understanding linear and simple quadratic functions use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics.	a maths project that will give the opportunity to apply the maths that they have learnt during that term.

	Reason mathematically 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 counterexamples begin to reason deductively in geometry, number and algebra, including using geometrical constructions(More explicit than previous curriculum) interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning(More explicit than previous curriculum) Explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally. (Much more emphasis on formal throughout)	

	Solve problems Develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems. (Multi-step &increasingly sophisticated) 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.	