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ETHOS COLLEGE

Ethos College

Curriculum Planning

GCSE Mathematics

Intent:

The Maths curriculum provides pupils at Ethos with a foundation for understanding number, reasoning, thinking skills and problem solving with resilience so that they are fully prepared for everyday life and future employment. We aim to challenge the misconception that maths is difficult. We identify what pupils need to make progress and provide a curriculum that incorporates the aims of the National Curriculum that meets the SEND and SEMH needs of pupils and maximises the outcomes for those that have often missed out on previous essential learning in maths. We offer a range of qualifications at key stage 4.

Implementation:

Our teaching and learning are underpinned by an approach designed to develop pupil understanding. Baseline assessments and prior knowledge provide our starting point for planning and teaching. We incorporate all the information we have gathered, academic targets, SEND and SEMH needs as identified on each pupil's one page profile, to provide a bespoke learning package which takes into account additional needs, learning styles and gaps in curriculum of every pupil within the group. New concepts and skills are broken down into small connected and structured steps enabling application to a range of contexts and pupils are given opportunities to practice skills and apply them to solve more complex problems. Links are made between other areas in maths, different subjects in school and real life situations. Pupils are encouraged to communicate, justify, argue and prove using mathematical vocabulary. Knowledge is embedded using retrieval practice tasks at the start of each lesson and revision of key skills prior to extended learning. Marking and feedback addresses misconceptions promptly and enables interventions that are timely. Summative assessments are undertaken supportively each half term and we further develop confidence by gradually building up pupils' familiarity with exam papers and requirements. Lots of topic revision and exam paper practice is provided in the weeks prior to the formal exam period each summer term.

Impact:

The maths curriculum ensures that the needs of all the pupils are met through high quality teaching and intervention where appropriate. Pupils achieve or exceed their expected targets in maths. Required grades are attained to enable pupils to follow their chosen post 16 pathway. By addressing SEMH needs alongside academic requirements in lessons, pupils make exceptional progress towards their Boxall targets.

Year 1

Time	Key Subject Content	Sequencing	Rationale	Careers, Industry Links and Cultural Capital	Reading	SEMH
Half Term 1: Sep – Oct	Number, powers, roots, decimals and rounding to 10,100,1000 a. Integers and place value	Use and order positive and negative numbers (integers) Order integers, decimals Add and subtract positive and negative numbers (integers) Recall all multiplication facts to 10 × 10, and use them to derive quickly the corresponding division facts Multiply or divide any number by powers of 10 Multiply and divide positive and negative numbers (integers) Use brackets and the hierarchy of operations (not including powers)	Significant time dedicated to number work, ascertaining students preferred methods of calculations, addressing misconceptions and developing strategies to aid fluency. -Build understanding of digit place value change Include extensive use of extended number line and real life situations (temperature scales) to embed understanding of +/- with negative numbers. Students often secure in whole number place value but need revision and emphasis on decimal place value and the concept of a single unit being divided by multiples of 10 hence 0.1>0.01>0.001 etc.	Understanding negative numbers in a temperature context is important in geography and science. In science negative and positive numbers enable calculations to include magnitude and direction	To ensure students can identify the written format of all number and identify the place value of any individual digit.	Students working on basic number skills work with through a range of tasks; memory, problem solving and exam style questions giving them the opportunity to give purpose full attention. (Boxall Strand A).
Half Term 1: Sep – Oct	b. Decimals	Use decimal notation and place value Identify the value of digits in a decimal or whole number	Students often secure in whole number place value but need revision and emphasis on decimal place value and the concept of a single unit being divided by	Being able to do calculations with decimals is an essential life skill e.g.,	Clarity is given for the verbal understanding. Students are aware that 0.43	In each lesson we model clearly how exam styles should be

		Use decimal notation and place value Compare and order decimal numbers Add, subtract, multiply and divide decimals, including calculations involving money Multiply or divide by any number between 0 and 1 Round to the nearest integer; Use one calculation to find the answer to another.	multiples of 10 hence 0.1>0.01>0.001 etc.	Money/budgeting Calculations involving decimal measurements	is zero point four three and not zero point forty-three.	completed this is then summarised in a group discussion where student participate in a range of questioning activities with the use of mini white boards for low stakes quizzes. (Boxall Strand A/B).
Half Term 1: Sep – Oct	c. Indices, powers and roots	Find squares and cubes: recall integer squares up to 10 x 10 and the corresponding square roots Understand the difference between positive and negative square roots; recall the cubes of 1, 2, 3, 4, 5 and 10; Use index notation for squares and cubes Evaluate expressions involving squares, cubes and roots: · add, subtract, multiply and divide numbers in index form; Use the square, cube and power keys on a calculator Use brackets and the hierarchy of operations with powers inside the	Students are made aware of the use of powers and roots as inverse operations which is a critical link when forming and solving equations	Use areas of squares and volumes of cubes to illustrate and gain understanding of the concepts	Exploration of the term 'raise to the power of'.	Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A).

		brackets, or raising brackets to powers Use calculators for all calculations: positive and negative numbers, brackets, powers and roots, four operations. List all three-digit numbers that can be made from three given integers;				
Half Term 1: Sep – Oct	d. Factors, multiples and primes	Use decimal notation and place value Identify the value of digits in a decimal or whole number; Compare and order decimal numbers Recognise odd and even numbers; Identify factors, multiples and prime numbers Recognise two-digit prime numbers List all factors of a number and list multiples systematically	It is critical for students to have a strong understand of the relationships between numbers, in that it is more protracted than just larger or smaller in terms of place value.	Understanding how to problem solve in a systematic manor.	Clarification of factors of a number creating that number and multiples are born from the given number. Task: Creation of number factory visual.	Create links for students to see how factors, multiples and primes help us to create links between numbers and connect up experiences. (Boxall strand A/C).
Half Term 1: Sep – Oct	Product of Prime Factors	Find the prime factor decomposition of positive integers and write as a product using index notation; Find common factors and common multiples of two numbers;	Encourage students to list factor pairs. Much emphasis on '2' as the only even prime. An easy extension building on understanding of factors and prime numbers	Embedding problem solving and reasoning skills.	Building upon the reading and language skills form the prior topic to further embed understanding around the	Create links for students to see how factors, multiples and primes help us to create links between

		Find the HCF of two numbers, by listing, Venn diagrams and using prime factors: include finding HCF given the prime factorisation of two numbers; Solve simple problems using HCF, LCM and prime numbers.			words 'Factors/ Multiples'	numbers and connect up experiences. (Boxall strand A/C).
Half Term 1: Sep – Oct	Fractions 1	Use diagrams to find equivalent fractions or compare fractions; Write fractions to describe shaded parts of diagrams; Write a fraction in its simplest form and find equivalent fractions; Order fractions, by using a common denominator; Convert between mixed numbers and improper fractions and decimals; Recognise recurring decimals and convert fractions such as 3/ 7 , 1 /3 and 2/3 into recurring decimals; Compare and order fractions, decimals and integers; Find fractions of amounts	A firm understanding of basic fractions, including visual representations e.g., of equivalence essential prior to introduction of percentages or +/- etc	Use of real-life situations to enable students to make links between language and mathematical operations and the order in which to use them. E.g., increase/decrease by… Sum of… Difference between… Total of…. Product of etc Explore worded exam problems that may need breaking down into smaller steps	Key word: Equivalent. This is a strategically important word when managing and manipulating fractions.	Students work through a series of challenging tasks working with a peer as appropriate, allowing them to give purpose full attention, participate constructively in the whole class discussion and connect up experiences. (Boxall stand A/B/C).

Half Term 1: Sep – Oct	Percentages	Understand that a percentage is a fraction in hundredths Convert between fractions, decimals and percentages Order fractions, decimals and percentages Express a given number as a percentage of another number Find a percentage of a quantity without a calculator: 50%, 25% and multiples of 10% and 5%; Find a percentage of a quantity Calculate amount of increase/decrease Find a quantity as a percentage of another Use percentages to solve problems, including comparisons of two quantities using percentages Make calculations involving repeated percentage change, not using the formula Use compound interest formula Reverse percentages	Emphasis is on f,d,p being equivalent and therefore the use of decimal multipliers calculate efficiently when using a calculator. Ensure lots of real-life problems including VAT and interest etc	Understanding percentages essential in aspects of money and budgeting and making comparisons in many aspects of life, e.g., working with percentiles as a health visitor	Exploration of the conceptions and connections in root words. Per – For every / Cent – Hundred.	When working with percentages students are able to draw upon personal experience such as shopping when items are on sale and reduced by a given percentages. This is a basis for whole class discussion. (Boxall strand A/B).
Half Term 1: Sep – Oct	Drawing and interpreting tables and charts	Sort, classify and tabulate data Use correct notation for time, 12- and 24-hour clock Work out time taken for a journey from a timetable	Most students operating beyond ELC are confident in this area but need revision and practice at functional exam style questions	Understanding the 24hour clock and timetables essential for journey planning Statistics is a crucial process	Students read/research to find their own tables and charts form current newspapers.	Students develop supportive listening skills through a supportive peer to peer

		Plotting coordinates in first quadrant and read graph scales in multiples Produce and interpret: pictograms; composite bar charts; dual/comparative bar charts for categorical and ungrouped discrete data; bar -line charts; line graphs; stem and leaf Calculate total population from a bar chart or table Find greatest and least values from a bar chart or table Find the mode from a stem and leaf diagram Identify the mode from a bar chart; Recognise simple patterns, characteristics, relationships in bar charts and line graphs. Interpret tables; represent data in tables and charts Know which charts to use for different types of data sets; Construct pie charts for categorical data and discrete/continuous numerical data Produce and interpret pie charts: o Find the mode and the frequency represented by each sector and the total frequency		behind how we make discoveries, make decisions based on data and make predictions, e.g., research jobs, marketing, economics, healthcare etc Understanding how to interpret graphs and charts enables students to make sense of data presented in other subjects, geography, history, science etc, journals, newspapers, tv etc		environment collaborating on research skills. (Boxall strand A/E).

		Compare data from pie charts that represent different -sized samples; Interpret simple pie charts using simple fractions and percentages; 1/2 , 1/4 and multiples of 10% sections Multiply and divide a fraction by an integer, including finding fractions of quantities or measurements, and apply this by finding the size of each category from a pie chart using fractions; Understand that the frequency represented by corresponding sectors in two pie charts is dependent upon the total populations represented by each of the pie charts.				
Half Term 1: Sep – Oct	Averages	Calculate the mean, mode, median and range for discrete data from a list or table Interpret and find a range of averages as follows: mode and range from a bar chart; median, mode and range from stem and leaf diagrams; mean from a bar chart Compare the mean, median, mode and range (as appropriate) of two distributions using bar charts, dual bar charts, pictograms and back-to-back stem and leaf;	S and L diagrams are usually new and need to be introduced as an efficient and visual method of ordering data and a visual representation of how the data is spread. - associated with finding median and range Construction of pie charts and interpretation of sectors (other than simple ½, ¼ etc) is dependent on being able to understand the concept and calculate how many degrees represent each item (or vice versa)	Use of logic and a systematic approach essential in problem solving	Handling data questions may involve formulating simple hypotheses and using their data analysis to interpret and explain their findings.	Students invest time in creating their own sets of averages allowing them to connect up experiences. (Boxall stand C)

		Recognise the advantages and disadvantages between measures of average.				
Half Term 2: Nov - Dec	Properties of shapes and simple angle facts	Estimate sizes of angles; Measure angles using a protractor; Use geometric language appropriately Use letters to identify points, lines and angles Use two-letter notation for a line and three-letter notation for an angle Describe angles as turns and in degrees Understand clockwise and anticlockwise; Know that there are 360° in a full turn, 180° in a half turn and 90° in a quarter turn; Identify a line perpendicular to a given line Mark perpendicular lines on a diagram and use their properties; · Identify parallel lines Mark parallel lines on a diagram and use their properties Recall the properties and definitions of special types of quadrilaterals, including symmetry properties	On introduction most students are familiar with many of basic angles and properties of triangles and quadrilaterals but revision is usually required as well as making links between properties of shapes e.g., relationship between equilateral triangle, square and rhombus, being regular versions of triangle, rectangle and parallelogram respectively. Similarly, links need to be made relating properties to angle rules. Students can usually recognise horizontal and vertical lines of symmetry but need practice with others, also rotational symmetry. Students need lots of practice of exam style questions.	Understanding of shape and angles are vital in design in art, graphics architecture and construction and associated industries. Being able to measure and calculate accurately are essential in precision industries such as engineering and construction.	Introduction of subject specific language	Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A).

		Recognise and name pentagons, hexagons, heptagons, octagons and decagons Understand ‘regular’ and ‘irregular’ as applied to polygons List the properties of each special type of quadrilateral, or identify (name) a given shape Draw sketches of shapes; Recall the definition of a circle Identify, name and draw parts of a circle including tangent, chord and segment Identify name and draw arcs and sectors Name all quadrilaterals that have a specific property Identify quadrilaterals from everyday usage Given some information about a shape on coordinate axes, complete the shape Classify quadrilaterals by their geometric properties; Understand and use the angle properties of quadrilaterals Use the fact that angle sum of a quadrilateral is 360° Recall and use properties of angles at a point, angles at a point on a straight line, right angles, and vertically opposite angles				

		Find missing angles in a triangle using the angle sum in a triangle AND the properties of an isosceles triangle Understand and use the angle properties of triangles, use the symmetry property of isosceles triangle to show that base angles are equal Use the side/angle properties of isosceles and equilateral triangles; Show step-by-step deduction when solving problems				
Half Term 2: Nov - Dec	Angles created by Parallel Lines	Understand and use the angle properties of intersecting lines; Understand a proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding and alternate angles, giving reasons; Use geometrical language appropriately and give reasons for angle calculations	Basic angle rules are more unfamiliar and links between angles in triangles and straight lines needs to be stressed. Also stress different orientations of isosceles triangles to ensure understanding that 2 equal angles do not necessarily lie on the horizontal. Emphasise need to give reasons when finding missing angles in a diagram	Continuation of the understanding of the real word applications to building support systems (load bearings).	Independent reading practice for exam style questions. With support of key words and phrase.	Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A)

Half Term 2: Nov - Dec	Exterior and Interior Angles in Polygons	Properties of quadrilaterals and the fact that the angle sum of a quadrilateral is 360° Use the sum of angles of irregular polygons Calculate and use the sums of the interior angles of polygons Calculate and use the angles of regular polygons Use the sum of the interior angles of an n-sided polygon Use the sum of the exterior angles of any polygon is 360°; Use the sum of the interior angle and the exterior angle is 180° Identify shapes which are congruent (by eye) Explain why some polygons fit together and others do not	A firm understanding of angles on a line, in a triangle, vertically opposite and at a point will lead to these two topics being an accessible extension. Though there is a need to be able to reason using a lot of geometrical terminology	Continuation of the understanding of the real word applications.	Students should be able to describe and identify the properties of shapes, compare similarities and differences in the relationship between angles.	Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A)
Half Term 2: Nov - Dec	Expressions & substituting into simple formulae a. Algebra: the basics b. Forming expressions c. Substitution d. Solving e. Rearranging	Use notation and symbols correctly; Write an expression; Manipulate and simplify algebraic expressions by collecting 'like' terms Multiply together two simple algebraic expressions, e.g., 2a × 3b; Simplify expressions by cancelling, e.g., 4 2 x = 2x Write expressions to solve problems representing a situation; Write expressions and set up simple equations	This is often a first introduction to algebra to students or earlier experiences may have led to a range of misconceptions. Emphasise that the notation and conventions are unfamiliar but concept of substitution and inverse are familiar in other contexts e.g., fill in the missing number, use of familiar simple formulae. Some students may have more knowledge and understanding and already have	A good understanding of basic algebra, how to rearrange and solve equations will enhance students understanding and use of formulae and equations in science, engineering,	Interpreting relationships expressed in words as the basis of forming algebraic expressions and formulae	Students are given the task of creating their own sets of forming and solving card sorts allowing them to connect up experiences and give purposeful attention for

		Use function machines Solve simple equations Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation Solve linear equations which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution; Solve linear equations in one unknown, with integer or fractional coefficients; Rearrange simple equations Substitute into a formula, and solve the resulting equation	secure and correct techniques for solving simple equations. Important to identify and build on these rather than learn new methods. Substitution of negative and fractional values into expressions provides a good opportunity for revision. Simple problems need to be introduced early on and regularly built on as these are common exam question which enable students to demonstrate fluency.	economics, business etc		an extended project. (Boxall stand A/C).
Half Term 2: Nov - Dec	Area and Perimeter	Solve angle or perimeter problems using algebra. Write an equation to solve a word problem. Indicate given values on a scale, including decimal value; Know that measurements using real numbers depend upon the choice of unit Convert between units of measure; Convert between metric units; Use a variety of metric measures Make sensible estimates of a range of measures in everyday settings	Revision of the relationships and conversion between metric measurements essential prior to work on area and perimeter. Students have usually covered area and perimeter previously but the concepts are often confused. Requires some discussion about linear measurements compared to 2D measurements. Linking to real life, concrete and visual contexts important. For composite shapes encourage students to identify and highlight required dimensions of familiar	Being able to calculate areas and perimeters are important in design and construction – and DIY tasks such as decorating, carpeting and tiling!		

		Measure shapes to find perimeters and areas using a range of scales Find the perimeter of rectangles and triangles Find the perimeter of parallelograms and trapezia; Find the perimeter of compound shapes Recall and use the formulae for the area of a triangle and rectangle Calculate the area of compound shapes made from triangles, rectangles. Find the area of a trapezium and recall the formula Find the area of a parallelogram	shapes (rectangles and triangles). For 1,2 a trapezium can often be split into T and R)			
Half Term 2: Nov - Dec	Circumference and Area of Circles	Identify, name and draw parts of a circle including tangent, chord and segment Recall and use formulae for the circumference of a circle and the area enclosed by a circle circumference of a circle = 2πr = πd, area of a circle = πr2 ; Find circumferences and areas enclosed by circles Use π ≈ 3.142 or use the π button on a calculator Give an answer to a question involving the circumference or area of a circle in terms of π;	Lessons deriving Pi by exploring the relationship between D and C of a variety of circular objects helps to develop an understanding. Similarly dissecting a circle into many sectors and forming a rectangle enables students to derive the Area formula. -Requires fluency in solving equations		Being able to describe the properties of shapes, compare similarities and differences.	

		Find radius or diameter, given area or perimeter of a circles Find the perimeters and areas of semicircles and quarter-circles Calculate perimeters and areas of composite shapes made from circles and parts of circles Calculate perimeters and areas of composite shapes made from circles and parts of circles (including semicircles, quarter-circles, combinations of these and also incorporating other polygons) Calculate arc lengths, angles and areas of sectors of circles				
Half Term 3: Jan - Feb	3D Forms	Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone Sketch nets of cuboids and prisms; Draw sketches of 3D solids Know the terms face, edge and vertex	Encourage students to explore concrete forms including a variety of 3D shapes which can be deconstructed to form their net (cereal and chocolate boxes etc) As with the comparison between Perimeter and area, the comparison between SA and volume can be explored. Volume can be explored as capacity including the relationship between cm cubed and ml etc.	Developing good special awareness is important in art, design, construction etc		

Half Term 3: Jan - Feb	Surface Area and Volume	Find the surface area of prisms using the formulae for triangles and rectangles Recall and use the formula for the volume of a cuboid Find the volume of a prism, including a triangular prism, cube and cuboid Calculate volumes of right prisms and shapes made from cubes and cuboids Convert between metric measures of volume and capacity e.g., 1ml = $1cm^3$. Find the surface area of a cylinder; Find the volume of a cylinder Recall and use the formula for volume of pyramid Find the surface area of a pyramid; Use the formulae for volume and surface area of spheres and cones Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders Round answers to a given degree of accuracy.	Fluency of C and A of circles required here		Students need to carefully read and follow instructions to perform accurate transformations and describe fully the single transformation given as a result of two or more other transformations	

Half Term 3: Jan - Feb	Ratio and Proportion	Understand and express the division of a quantity into a of number parts as a ratio Write ratios in their simplest form; Compare ratios Write/interpret a ratio to describe a situation Share a quantity in a given ratio including three-part ratios Solve a ratio problem in context: Use a ratio to find one quantity when the other is known Use a ratio to compare a scale model to a real-life object Use a ratio to convert between measures and currencies Problems involving mixing, e.g., paint colours, cement and drawn conclusions Write ratios in form 1 : m or m : 1 Write a ratio as a fraction Write lengths, areas and volumes of two shapes as ratios in simplest form Scale up recipes Find amounts for 3 people when amount for 1 given Solve proportion problems using the unitary method Scale up recipes and decide if there is enough of each ingredient	For 3,4,5 understanding of rounding to given d.p and s.f encouraged throughout all learning when required Emphasise ratio as a comparison of parts and proportion as a part of a whole. Students usually understand simplifying ratios in the same way as they would simplify fractions and vice versa. Bar modelling is an effective way to introduce sharing quantities in a given ratio and enables students to solve problems where one quantity is known. This is a familiar context for students so they readily understand most problems of scaling up or down with development required to understand the unitary method e.g., quantities known for 7, required for 3	An understanding of ratio and proportion enables students to make comparisons, calculate best value and scale quantities up or down, e.g. Convert a recipe for 4 people to a recipe for 7 people	Much use is used of recipes and mixtures that would be used in real life. The accurate reading of questions involving ratio determine the correct approach to take, e.g., the difference between Find ¼ of….. Or a1/4 of a number is…	

Half Term 3: Jan - Feb	Probability	Distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur Mark events and/or probabilities on a probability scale of 0 to 1 Write probabilities in words or fractions, decimals and percentages Find the probability of an event happening using theoretical probability Use theoretical models to include outcomes using dice, spinners, coins List all outcomes for single events systematically	Most students already understand the language associated with probability and readily move to a 0 to 1 scale. Simple probability of single events is accessible for almost all students. Students will usually understand that probabilities of independent events total 1 and this is reinforced when probabilities expressed as decimals	Being able to calculate probabilities enable students to make decisions based on predictions e.g., becoming proficient in strategic games involving probability. Probability is used in weather forecasting, insurance and marketing	Ensure confident use of the language of probability	Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A).
Half Term 4: Feb - April	Two way tables, Frequency Trees and Venn Diagrams	Read information from a two-way table. Use information provided to complete a two-way table Work out probabilities from two-way tables Work out probabilities from a frequency tree Complete a partially completed Venn diagram to sort information Work out probabilities from Venn diagrams to represent real-life situations and 'abstract' sets of numbers/values	This is a good topic to build on from probability. Students can usually complete frequency trees with ease but may need some modelling to show why a 2 way table is useful to organise data		It is important for students when exploring relationships between 2 variables to carefully read the information which needs to be presented graphically. They also need to be able to describe their findings.	

		Design, draw and use a Venn diagram from words Use union and intersection notation and also the P(A)' notation				
Half Term 4: Feb - April	Multiples in Context	List multiples of numbers systematically Find common multiples of two number Find the LCM of two numbers, by listing, Venn diagrams and using prime factors: include finding LCM given the prime factorisation of two numbers Solve problems using LCM in context (time, number of laps, number of items) including 3 or 4 different numbers	This gives students an opportunity to revise multiples and LCM and the contexts are often fun to model. Task: Fizz Buzz			
Half Term 4: Feb - April	Best Value	Solve word problems to work out which product is the better buy	An opportunity for students to reason and problem solve using a familiar context. Students can build upon concepts of unitary method and scaling up/down to find cost per unit etc Distinguish between efficient calculator and non-calculator methods.			

Half Term 4: Feb - April	Exchange Rates	Convert between currencies; Draw and interpret conversion graphs specifically currency conversion Compare prices of the same item in different currencies and determine best value. Convert between currencies in context and know when it is appropriate to do so.	Conversion graphs are an easy visual representation of a linear relationship between 2 values and accessible to use by most students. In calculations encourage students to use reasoning to determine correct calculations. Visit to escape rooms to use maths skills in context.	Being able to convert between currencies is essential for business and trade in a global economy also for paying for goods and services when travelling abroad.		
Half Term 5: April - May	Sequences	Recognise sequences of odd and even numbers, and other sequences including Fibonacci sequences Write the term-to-term definition of a sequence in words Find a specific term in the sequence using position-to-term or term-to-term rules Generate arithmetic sequences of numbers, triangular number, square and cube integers and sequences derived from diagrams Recognise such sequences from diagrams and draw the next term in a pattern sequence Find the next term in a sequence, including negative values Find the nth term of a linear sequence	An opportunity to remind students that all multiplication tables are sequences too. This underpins the understanding of 'finding the nth term' Confidence in changing the subject of an equation required.	Number patterns are important in Mathematics and can also help in the study of nature and geometric patterns and art and design. There is an important link between number patterns and patterns in music.		

		Find the nth term of an arithmetic sequence Use the nth term of an arithmetic sequence to generate terms Use the nth term of an arithmetic sequence to decide if a given number is a term in the sequence, or find the first term over a certain number Continue a quadratic sequence and use the nth term to generate terms Distinguish between arithmetic and geometric sequences.				
Half Term 5: April - May	Transformations Translations, Vector, Congruence, Reflections, Enlargement, Similarity	Understand that translations are specified by a distance and direction using a vector Translate a given shape by a vector Describe and transform 2D shapes using single translations on a coordinate grid Use column vectors to describe translations Understand the effect of one translation followed by another, in terms of column vectors (to introduce vectors in a concrete way) Understand that rotations are specified by a centre, an angle and a direction of rotation	Some prior knowledge revision on co-ordinates in all 4 quadrants and labelling horizontal lines may be required(may be new to some students) Encourage use of tracing paper for rotations. Students should translate point by point. Emphasise the intuitive nature of vectors (+up/right – down/left) A relatively straight forward topic of multiplying and +/- vectors for grade 5 Most lines of symmetry students will be expected to identify are x/y axis or x = n y = n Demonstrate also x=y Encourage students to enlarge each side separately and emphasise preservation of angle	Being able to effectively use the transformation of shapes is useful in art and design. An understanding of vectors is essential in science and engineering in order to describe movement in terms of magnitude and direction, e.g., velocity Being able to calculate		Students enjoy this topic and its practical nature. Students work in groups to participate constructively; they are able to give and receive accurate feedback and support and manage their own needs with taking

		Find the centre of rotation, angle and direction of rotation and describe rotations Describe a rotation fully using the angle, direction of turn, and centre Rotate a shape about the origin or any other point on a coordinate grid Draw the position of a shape after rotation about a centre (not on a coordinate grid) Identify correct rotations from a choice of diagrams Understand and use column notation in relation to vectors Be able to represent information graphically given column vectors Identify two column vectors which are parallel Calculate using column vectors, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector. Understand that distances and angles are preserved under rotations and translations, so that any figure is congruent under either of these transformations. Understand that reflections are specified by a mirror line	when drawing diagonal lines. Emphasise that the centre determines the position on the grid, once identified, can just draw enlarged shape At this level students should practice exam questions which require the SF of a given enlargement to be calculated as the step to find missing side lengths of either shape.	sizes of similar shapes is essential in areas which require scale drawings, e.g., design and architecture		turns with equipment

		Identify correct reflections from a choice of diagrams Identify the equation of a line of symmetry Transform 2D shapes using single reflections (including those not on coordinate grids) with vertical, horizontal and diagonal mirror lines; · Describe reflections on a coordinate grid Scale a shape on a grid (without a centre specified) Understand that an enlargement is specified by a centre and a scale factor Enlarge a given shape using (0, 0) as the centre of enlargement, and enlarge shapes with a centre other than (0, 0) Find the centre of enlargement by drawing Describe and transform 2D shapes using enlargements by, a positive integer scale factor, a fractional scale factor Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides, simple integer scale factors, or simple fractions				

		Understand that distances and angles are preserved under reflections, so that any figure is congruent under this transformation Understand that similar shapes are enlargements of each other and angles are preserved – define similar in this unit Use the basic congruence criteria for triangles (SSS, SAS, ASA and RHS) Solve angle problems involving congruence Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides Prove that two shapes are similar by showing that all corresponding angles are equal in size and/or lengths of sides are in the same ratio/one is an enlargement of the other, giving the scale factor Understand the effect of enlargement on angles and perimeter of shapes Solve problems to find missing lengths in similar shapes Know that scale diagrams, including bearings and maps are 'similar' to the real -life examples.				

Half Term 5: April - May	Rounding and Error Intervals	Round to a given number of decimal places Round to any given number of significant figures Check answers by rounding. Round answers to a given degree of accuracy. Use inequality notation to specify simple error intervals due to truncation or rounding. Estimate answers to calculations by rounding numbers to 1 significant figure or an appropriate level of rounding Estimate answers to one - or two - step calculations, including use of rounding numbers and formal estimation to 1 significant figure: mainly whole numbers and then decimals.	Emphasise how questions are posed in exams, e.g., 'give your answer to....' 'Estimate the answer to.....'	Understanding error intervals skills are used when scientists and engineers need to work to a specified level of accuracy. Being able to round numbers efficiently enable us all to make estimates to everyday calculations when 'on the go'		Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A)
Half Term 5: April - May	Speed, Distance, Time	Convert between metric speed measures Read values in km/h and mph from a speedometer Calculate average speed, distance, time – in miles per hour as well as metric measures; use kinematics formulae to calculate speed, acceleration (with formula provided and variables defined in the question)	Liaise with science department as to preferred method of calculation for students not confident with 'changing the subject', e.g., use of formula triangles and links with unit measurements	Understanding the relationship between speed, distance and time allow us to plan journeys. This is useful for everyone but especially to people who plan road and transport		Links closely with Boxall strand C (connecting up experiences). We work to create clear contextual connexions for students in relation to

		Change d/t in m/s to a formula in km/h, i.e., d/t × (60 × 60)/1000 – with support		systems. Astronomers use these calculations in finding out about stars, planets and satellites.		speeds they may have travelled at, and link this to experiences we have had as individuals or as a group.
Half Term 5: April - May	Real Life Graphs	Read values from straight-line graphs for real-life situations; Gradient of a straight line from real-life graphs Interpret gradient as the rate of change in distance–time and speed–time graphs, graphs of containers filling and emptying, and unit price graphs. Draw straight line graphs for real-life situations, including ready reckoner graphs, fuel bills graphs, fixed charge and cost per unit Draw distance–time graphs and velocity–time graphs Work out time intervals for graph scales Interpret distance–time graphs, and calculate: the speed of individual sections, total distance and total time; Interpret information presented in a range of linear and non-linear graphs	Make links between graphs and familiar situations in real life, e.g., by sketching shapes of graphs, journey to school, filling the bath etc rather than 'maths problems!			

Half Term 5: April - May	Scatter Graphs	Draw scatter graphs; Interpret points on a scatter graph; Identify outliers and ignore them on scatter graphs; Explain an isolated point on a scatter graph Draw the line of best fit on a scatter diagram by eye, and understand what it represents Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing; Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem Use a line of best fit to predict values of a variable given values of the other variable Interpret scatter graphs in terms of the relationship between two variables Interpret correlation in terms of the problem Understand that correlation does not imply causality State how reliable their predictions are, i.e., not reliable if extrapolated.	Make links with scatter graphs in science including discussion about variables, similarities and differences.	Scatter graphs and other 'real life graphs' are used by researchers to see if there are important relationships between 2 sets of information		

Half Term 6: June - July	Fractions	Add and subtract fractions; Add fractions and write the answer as a mixed number Understand and use unit fractions as multiplicative inverses Multiply fractions: simplify calculations by cancelling first Divide a fraction by a whole number Divide fractions by fractions. Add and subtract mixed number fractions Multiply mixed number fractions; Divide mixed numbers by whole numbers and vice versa Find the reciprocal of an integer, decimal or fraction Understand 'reciprocal' as multiplicative inverse, knowing that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal because division by zero is not defined).	Some revision and practice of equivalent fractions may be required and grade 1,2,3 can +/- simple fractions with different denominators, halves, quarters, eighths etc Encourage all students understand that a/b can be calculated as a divided by b and develop use of / as alternative to divide symbol. Emphasise a/0.n is equivalent to a x n	Fractions allow us to break whole quantities into smaller parts, e.g., minutes are fractions of an hour; degrees are fractions of a full turn.	Reading questions allowed to assist with decoding as fractions questions can be use a range of complex language, which is then explained and discussed as a group.	Providing students the opportunity for meaningful engagement. Task: Creating their own questions to deepen conceptual understanding of fractions and how question structure can add extra layers of challenge.
Half Term 6: June - July	Pythagoras	Understand, recall and use Pythagoras' Theorem in 2D, including leaving answers in surd form Given 3 sides of a triangle, justify if it is right-angled or not Calculate the length of the hypotenuse in a right-angled	Will require revision and practice of squares and square roots. Rather than teach Pythagoras as a formula encourage students to see the relationships between all 3 sides as there being the hypotenuse and 2 shorter sides. Use the squares drawn on each	Pythagoras and trigonometry are widely used in design and construction		Modelling of the new mathematic concepts gives students the opportunity to apply purposeful

		triangle, including decimal lengths and a range of units Find the length of a shorter side in a right-angled triangle; Apply Pythagoras' Theorem with a triangle drawn on a coordinate grid Calculate the length of a line segment AB given pairs of points	side of the triangle to illustrate. Grade 4/5 students can do exam style questions linked to finding distances using Pythagoras and angles using parallel line rules (Supplementary angles)			attention. (Boxall strand A)
Half Term 6: June - July	Bearings and Scale Drawing	Use and interpret maps and scale drawings Know that scale diagrams, including bearings and maps are 'similar' to the real-life examples. Estimate lengths using a scale diagram Make an accurate scale drawing from a diagram Use three-figure bearings to specify direction Mark on a diagram the position of point B given its bearing from point A Give a bearing between the points on a map or scaled plan Given the bearing of a point A from point B, work out the bearing of B from A Use accurate drawing to solve bearings problems.	This is an opportunity to revise measuring lines and drawing angles accurately.	Bearing and scale drawings are used in map reading and plotting. If you were in charge of a boat you would need these skills to navigate the seas.	Working through key words and subject specific vocabulary. Understanding the colloquial term 'getting/finding your bearings'.	Through prompting recall students are able to create meaningful connections and connect up experiences in taught content and exploration with group discussion around each other lived experiences (Holidays/ Orienteering). (Boxall strand A/B/C) .

Half Term 6: June - July	Plotting Straight Line Graphs y=mx+c	Use accurate drawing to solve bearings problems Draw, label and scale axes; · Plot and draw graphs of y = a, x = a, y = x and y = –x, drawing and recognising lines parallel to axes, plus y = x and y = – x Recognise that equations of the form y = mx + c correspond to straight -line graphs in the coordinate plane Plot and draw graphs of straight lines of the form y = mx + c using a table of values Plot and draw graphs of straight lines of the form y = mx + c with and without a table of values Plot and draw graphs of straight lines in the form ax + by = c	Fluency in substituting values, including negatives, into a formula needed. Emphasise that graphs of linear equations are always straight lines, hence the ability to self -correct. Requires understanding of m as gradient and c as intercept and ability to change the subject.			Modelling of the new mathematic concepts gives students the opportunity to apply purposeful attention. (Boxall strand A)

Year 2

Time	Key Subject Content	Sequencing	Rationale	Careers, Industry Links and Cultural Capital	Reading	SEMH
Half Term 1 Sep – Oct	Index Laws	Use the laws of indices to multiply and divide numbers written in index notation Use index notation when multiplying or dividing algebraic terms Use index laws in algebra Use index notation in algebra.	Develop efficient and accurate use of scientific calculators. Important to spend time deriving the rules in order to develop understanding and fluency in their use.	Index laws and the relationship they have to how our number system works in base 10 and why this is. We have a brief	Students need to recognise and interpret the requirements of the questions, looking for key	Embedding purposeful attention through the development of Boxall strand C. Connecting up experiences. Students look at

		Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractions and powers of a power Use numbers raised to the power zero, including the zero power of 10		discussion in group around how thing would be different if we worked in base 2 or base 5.	indicator worked such as 'simplify' as oppose to 'work out'.	prior understanding to create links in learning. This is done through key questioning and flipped learning approach. (Boxall strand A/C).
Half Term 1 Sep – Oct	Standard Index Form	Convert large and small numbers into standard form and vice versa Add and subtract numbers in standard form Multiply and divide numbers in standard form Interpret a calculator display using standard form and know how to enter numbers in standard form	Introduce and develop as an efficient way of writing very large or small values. Make links with understanding about place value and links with real life situations and science. Teach students to view a number in sf as a single value hence enable them to perform multistep calculations on a scientific calculator.	Standard Index Form is used in science, engineering and medicine to express and do calculations with very large and very small numbers.	Students gain an understanding of subject specific vocabulary ensure understand around some very examples; atoms/ light years.	Build students ability to provide purposeful attending through offering a range of tasks form card sorting exercises, memory exercises and exam practise with peer support. (Boxall strand A).
Half Term 1 Sep – Oct	Expand and Simplify	Multiply a single number term over a bracket Write and simplify expressions using squares and cubes Simplify expressions involving brackets, i.e., expand the brackets, then add/subtract	Spend time ensuring students are correctly calculating with negative numbers when simplifying following expansion. Ensure clarity when introducing multiplying together two algebraic expressions with brackets as distinct from two sets of multiplying out single	Students are aware that all algebra skills are problem solving skills and are based on the fundamental	Exploration of root words and understanding exam indicator words.	Tasks are kept short to allow for purpose full attention to be maintained throughout the lesson. (Boxall strand A).

		Argue mathematically to show algebraic expressions are equivalent; Recognise factors of algebraic terms involving single brackets Define a 'quadratic' expression Multiply together two algebraic expressions with brackets Know that squaring a linear expression is the same as expanding double brackets Square a linear expression, e.g. $(x + 1)^2$	brackets! Students should have fluency in HCF.	practise of our number system.		
Half Term 1 Sep – Oct	Factorising	Recognise factors of algebraic terms involving single brackets Factorise algebraic expressions by taking out common factors. Recognise factors of algebraic terms involving single brackets and simplify expressions by factorising, including subsequently collecting like terms Factorise quadratic expressions of the form x 2 + bx + c Factorise a quadratic expression x 2 – a 2 using the difference of two squares Solve quadratic equations by factorising Find the roots of a quadratic function algebraically.	Requires students being able to identify 2 numbers which total b with a product of c	We explore some of the history of algebra and the requirement to understand algebraic principles in computer graphics/coding	Exploration of root words and understanding exam indicator words.	Students work toward Boxall strand A (Gives purpose full attention). Independent practise and exam skills are intrinsic to our lessons.

Half Term 2: Oct - Dec	Averages from a Table and Grouped Data	Compare the mean, median, mode and range (as appropriate) of two distributions using bar charts, dual bar charts, pictograms and back-to back stem and leaf Recognise the advantages and disadvantages between measures of average. Extract data from lists and tables Calculate the total frequency from a frequency table Interpret and find a range of averages from: median, mean and range from a (discrete) frequency table, range, modal class, interval containing the median, and estimate of the mean from a grouped data frequency table Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values Read off frequency values from a table Read off frequency values from a frequency table Find greatest and least values from a frequency table Identify the mode from a frequency table	This builds on student's prior knowledge around data/ how data is displayed. Mean, Median, Mode and Range is KS2 introduced topic. This provides an opportunity to clarify any common misconceptions carried through.	We use real world data to explore how averages/ charts and graphs are used in industry. Task: Creating manipulated data sets to suit a specific agenda	Frequency: Key word students struggle to grasp. We spend additional time exploring the root of the word and creating our own definition.	Students are able to engage with their peers when creating their own data sets. As we gain an understanding that the more data we have typically the more accurate and representative the data is. (Boxall strand B/E).

		Identify the modal class from a grouped frequency table.				
Half Term 2: Oct - Dec	Inequalities	Show inequalities on number lines Write down whole number values that satisfy an inequality Solve an inequality such as –3 < 2x + 1 <7 and show the solution set on a number line Solve two inequalities in x, find the solution sets and compare them to see which value of x satisfies both Use the correct notation to show inclusive and exclusive inequalities Construct inequalities to represent a set shown on a number line Solve simple linear inequalities in one variable, and represent the solution set on a number line Round answers to a given degree of accuracy. Use inequality notation to specify simple error intervals due to truncation or rounding.	Ensure students understand terms number and integer hence whether inequality shown as integers or on or number line	We explore the use of inequalities in terms of problems solving and multiple solutions that satisfy the statement and how in industry that would provide a range of solutions or cost advantages.	Modelling the use of the language in context, less than, more than. Followed up with low stakes assessment for understanding.	Through prompting recall students are able to create meaningful connections and connect up experiences in taught content. (Boxall strand A/B/C).
Half Term 2: Oct - Dec	Probability and Probability Trees	Work out probabilities from a list or frequency tables Record outcomes of probability experiments in tables Add simple probabilities	Requires understanding of adding and subtracting/ multiplication of fractions and to understand the clear different in the and/ or rule when calculating expected probabilities	Links discussed to a range of industries. Looking in more detail about the	Teaching an understanding of inference within probability statements. If a	Collaborative problem solving allows us to establish understanding, and maintaining

		Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1 Find the probability of an event happening using relative frequency Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities List all outcomes for combined events systematically Use and draw sample space diagrams Compare experimental data and theoretical probabilities Compare relative frequencies from samples of different sizes Understand conditional probabilities and decide if two events are independent Draw a probability tree diagram based on given information, and use this to find probability and expected number of outcomes Understand selection with or without replacement Calculate the probability of independent and dependent combined events		insurance premium calculations.	statement is made we can suggest the opposing statement.	an environment for purposeful attention and allows students to engage cognitively with peers (Boxall strand A/E).

		Find the probability of successive events, such as several throws of a single dice Use tree diagrams to calculate the probability of two independent events Use tree diagrams to calculate the probability of two dependent events.				
Half Term 3: Jan – Feb	Forming and Solving Equations	Write expressions to solve problems representing a situation Write expressions and set up simple equations Answer 'show that' questions using consecutive integers (n, n + 1), squares a 2 , b 2 , even numbers 2n, and odd numbers 2n +1 Form and solve equations in various contexts such as; a. Time / ages / Number of items / Costs b. Perimeter c. Area (including compound shapes and those that result in quadratic expressions) d. Probability e. Interior / exterior angles Including terms that include brackets and unknowns on both sides.	A good understanding of basic formulas such as area/ area of triangle is helpful to support students in forming equations.	Having a secure understanding of the different words that can be used to represent the four different operations, i.e. Take away/ less than, meaning to subtract	Higher order thinking skills should be modelled and explained to students to allow them easier access to the course content.	Reduced task size to allow students to give purposeful attention without the becoming overwhelmed with the more challenging aspects of this topic area. (Boxall strand A).

Half Term 3: Jan – Feb	Time Series	Construct tables for time–series data Extract data from lists and tables Construct and interpret time–series graphs, comment on trends	Students should understand that a time series graph is a line graph of repeated measurements taken over regular time intervals. Student should have the opportunity to look for patterns or trends/predictions.	Through the use of real-life examples of time series graphs from different industries. Task: Investigate interest rates time series.		Create opportunities for encouraging critical reflection and then group/one to one discussion to allow for constructive participations (Boxall strand B).
Half Term 4: Feb – April	Quadratic and cubic Graphs.	Generate points and plot graphs of simple quadratic functions, then more general quadratic functions Identify the line of symmetry of a quadratic graph Find approximate solutions to quadratic equations using a graph Interpret graphs of quadratic functions from real-life problems Identify and interpret roots, intercepts and turning points of quadratic graphs. Recognise, sketch and interpret graphs of simple cubic functions Recognise, sketch and interpret graphs of the reciprocal function 1 y x = with x ≠ 0 Recognise a linear, quadratic, cubic and reciprocal graph from its shape	Worth doing if students confident with linear graphs and substitution. As with linear graphs = straight lines. Students should recognise the shape of the graphs in order to self-correct. Find and replace activity; Student move/substitute cards into algebra statements.	Students will engage with mathematical concepts, thinking quantitatively and analytically to express statements using mathematical language.	Have students recap understanding of the word substitution. Task: Create personal definitions of substitution.	As this is one of the more challenging topics Use interactive strategies, e.g., pupils have cards/whiteboards to hold up answers, come to the front to take a role. This builds on both constructive participation and giving purposeful attention. (Boxall strand A/B).

Half Term 5: April – May	Revision, Practice, Addressing 'Gaps' Past Paper Practice	Personalised closing the gap activities resulting from mock exam results				
Half Term 6: June - July	Revision, Practice, Addressing 'Gaps' Past Paper Practice	Personalised closing the gap activities resulting from mock exam results				