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| **Year 7 Mathematics Curriculum – 2020-21 (**Stage 5 – **STAGE 6** -Stage 7 **)** | | | | | | |
|  | **Autumn Term** | | **Spring Term** | | **Summer Term** | |
|  | **1** | **2** | **1** | **2** | **1** | **2** |
| Key Concepts | A Number & the number system  B Calculating  C Calculating -Division | D Exploring FDP  E Calculating FDP  F Manipulating algebra | G Solving equations & Inequalities  H Probabilities  I Sequences | J Investigating properties of shape  K Measuring space  L Calculating space  M Transformations | N Checking & approximating  O Investigating angles  P Visualising & constructing | Q Proportional reasoning  R Statistics-graphs  S Statistics -averages |
| National Curriculum Knowledge & Understanding | A   * Multiply (divide) numbers with up to three decimal places by 10, 100, 1000 **N17a, N17b** 11 * Understand (order, write, read) place value in numbers with up to eight digits **N1a, N1b** * Understand and use negative numbers when working with temperature **23** 1 * Understand and use negative numbers when working in other contexts **23** 1 * Know the meaning of a common multiple (factor) of two numbers **N31b** 34-35 * Identify common multiples (factors) of two numbers **N31 a** 34-35 * Know how to test if a number up to 120 is prime **N30a** * Recall prime numbers up to 50 **N30a** * Place a set of negative numbers in order **N2a** * Place a set of mixed positive and negative numbers in order **N2a** * Identify a common denominator that can be used to order a set of fractions  **N34** 46 * Order fractions where the denominators are not multiples of each other **N34**  47 * Order a set of numbers including a mixture of fractions, decimals and negative numbers **N34, N2a, N2b** 8 * Use inequality symbols to compare numbers **A20a**   Make correct use of the symbols = and ≠ **A20a**  B   * Combine addition and subtraction when multiplying mentally * Multiply a two-digit number by a single-digit number mentally * Add a three-digit number to a two-digit number mentally (when bridging of hundreds is required) **N3a** * Multiply a four-digit number by a two-digit number using long multiplication **N28a** 4-5 * Identify when addition, subtraction or multiplication is needed as part of solving multi-step problems 3-7 * Explain why addition or subtraction is needed at any point when solving multi-step problems * Solve multi-step problems involving addition, subtraction and/or multiplication **N20** 3-7 * Understand and apply the fact that addition and subtraction have equal priority **N20** 15-16 * Understand and apply the fact that multiplication and division have equal priority **N20** 15-16   Know that multiplication and division take priority over addition and subtraction **N20** 15-16  C   * Use short division to divide a four-digit number by a one-digit number **N16** 6-7 * Use short division to divide a three- (or four-) digit number by a two-digit number **N16** 6-7 * Understand the method of long division **N29a** 6-7 * Use long division to find the remainder at each step of the division **N29a** 6-7 * Know how to write, and use, the remainder at each step of the division **20** 6-7 * Use long division to divide a three- (or four-) digit number by a two-digit number **N29a** 6-7 * Write the remainder to a division problem as a remainder **20** 6-7 * Write the remainder to a division problem as a fraction **20** 6-7 * Extend beyond the decimal point to write the remainder as a decimal **20** * Identify when division is needed to solve a problem * Extract the correct information from a problem and set up a written division calculation**20** 6-7   Interpret a remainder when carrying out division 6-7 | D   * Understand that two fractions can be equivalent **25** 42-43 * Identify a common factor of two numbers **79** * Simplify a fraction **26** 43-44 * Write a fraction in its lowest terms **26** 43-44 * Confirm that a fraction is written in its lowest terms **26** 43-44 * Compare two fractions by considering diagrams **70** * Compare two fractions by considering equivalent fractions **70** 46 * Compare two top-heavy fractions **70** * Understand that a fraction is also a way of representing a division * Work out the decimal equivalents of fifths, eighths and tenths **85**  56-59 * Work out the percentage equivalents of fifths, eighths and tenths **85** * Use the equivalence between fractions, decimals and percentages when solving problems **85** 77-80 * Convert between mixed numbers and top-heavy fractions **N35** 44-45   Understand that a percentage means ‘number of parts per hundred’ **N24a**  E   * Add (subtract) fractions with different denominators **N36** 48-49 * Add (subtract) a mixed number and a fraction, including with different denominators **N36, N41** 50-51 * Add (subtract) mixed numbers, including with different denominators **N36, N41** 50-51 * Multiply a proper fraction by a proper fraction **N37a, N42a**  53 * Divide a proper fraction by a whole number **N37b** 55 * Divide a proper fraction by a proper fraction **N42b** 55 * Simplify the answer to a calculation when appropriate **N23c** * Multiply U.t by U **N15b, N28b** * Multiply U.th by U **N15b, N28b** * Find 10% of a quantity **N24b** 75-76 * Use non-calculator methods to find a percentage of an amount **N24b** 75-76 * Use decimal or fraction equivalents to find a percentage of an amount where appropriate **N24b** 76-77   Solve problems involving the use of percentages to make comparisons **N39b** 76-77  F   * Create a one-step formula from given information **A3** 116-117 * Create a two-step formula from given information **A3** 116-117 * Use symbols to represent variables in a formula **A3** 116-117 * Know the meaning of expression, term, formula, equation, function **A2** * Know basic algebraic notation (the rules of algebra) **A4** * Use letters to represent variables **A4** 116-117 * Identify like terms in an expression **A6** 89 * Simplify an expression by collecting like terms **A6** 89-90 * Know how to multiply a (positive) single term over a bracket (the distributive law) **A7a** 91-93 * Substitute positive numbers into expressions and formulae **A10** 118-120 * Given a function, establish outputs from given inputs **N26** 124-125 * Given a function, establish inputs from given outputs **N26** 124-125 * Use a mapping diagram (function machine) to represent a function **N26** 124-125 * Use an expression to represent a function   Use the order of operations correctly in algebraic situations 125-126 | G   * Solve missing number problems expressed in words **A3** 105-107 * Find a solution to a missing number problem with two unknowns 125-126 * Find all combinations of two variables that solve a missing number problem with two unknowns * Know the basic rules of algebraic notation **A4** * Express missing number problems algebraically 105-107 * Solve missing number problems expressed algebraically 98-99 * Choose the required inverse operation when solving an equation **A12** 98-99 * Identify the correct order of undoing the operations in an equation **A12** 98-99 * Solve one-step equations when the solution is a whole number (fraction) **A12** 98-99   Solve two-step equations (including the use of brackets) when the solution is a whole number **A12**  100-102  H   * Know that probability is a way of measuring likeliness **P1** 342 * Know and use the vocabulary of probability **P1** 342-344 * Understand the use of the 0-1 scale to measure probability **P1** 342-344 * Assess likeliness and place events on a probability scale **P1** 342-344 * List all the outcomes for an experiment **P2a** 348-350 * Identify equally likely outcomes 344-345 * Work out theoretical probabilities for events with equally likely outcomes 344-345 * Know how to represent a probability * Recognise when it is not possible to work out a theoretical probability for an event * Know that the sum of probabilities for all outcomes is 1 **P1**   Apply the fact that the sum of probabilities for all outcomes is 1 **P3** 346-347  I   * Describe a number sequence 127-128 * Find the next term in a linear sequence 127-128 * Find a missing term in a linear sequence 127-128 * Generate a linear sequence from its description **A11a** 127-128 * Use a term-to-term rule to generate a linear sequence **A11a** 127-128 | J   * Know the definitions of special triangles **G16**  170 * Classify 2D shapes using given categories; e.g. number of sides, symmetry * Know the vocabulary of 3D shapes **G12a** * Know the connection between faces, edges and vertices in 3D shapes **G12a** 261 * Visualise a 3D shape from its net **G12c** 261-264 * Recall the names and shapes of special triangles and quadrilaterals **G16, G14** 170, 176, 177,178-names nit angles * Know the meaning of a diagonal of a polygon * Know the properties of the special quadrilaterals (including diagonals) **G14** * Apply the properties of triangles to solve problems **G16**   Apply the properties of quadrilaterals to solve problems **G14**  K   * Convert between non-adjacent metric units; e.g. kilometres and centimetres **R2, 112** 192-196 * Use decimal notation up to three decimal places when converting metric units * Convert between Imperial units; e.g. feet and inches, pounds and ounces, pints and gallons **R2, 112** 197 * Solve problems involving converting between measures **R2, 112** 192-196 * State conclusions using the correct notation and units * Know that one inch is roughly equivalent to 2.5 cm **R2, 112** 192-199 * Know that one foot is roughly equivalent to 30 cm **R2, 112** 192-199 * Know that one kilogram is roughly equivalent to 2.2 lb **R2, 112** 192-199 * Know that one pint is roughly equivalent to 550 ml **R2, 112** 192-199   Use rough equivalents between metric and Imperial units when solving problems  L   * Recognise that shapes with the same areas can have different perimeters and vice versa * Know that the area of a parallelogram is given by the formula area = base × height **G20b** 248 * Know that the volume of a cuboid is given by the formula volume = length × width × height  **G21a** 270 * Calculate the area of a parallelogram (triangle) (Recognise when it is possible to use a formula for the area of a shape) **G20b, G20c** * Estimate the volume of cubes and cuboids * Choose appropriate units of volume * Calculate the volume of a cuboid 270 **G21a** * Recognise when it is possible to use a formula for the volume of a shape 270 * Convert between metric units of area in simple cases **R2, 112** 194-196   Convert between metric units of volume in simple cases **R2, 112** 194-196  M   * Construct a 2-D coordinate grid (all four quadrants) **A1a, A1b** 134-135 * Use coordinates to plot a set of points to construct a polygon **A1a, A1b** 134-135 * Solve problems involving coordinates **A1a, A1b** 134-135   Simple enlargement of a 2D shape (no centre of enlargement)**G28** 294-295 | N   * Approximate any number by rounding to the nearest 1 000 000 **N27a** * Approximate any number by rounding to a specified degree of accuracy; e.g. nearest 20, 50 **N27a** * Use estimation to predict the order of magnitude of the solution to a (decimal) calculation * Check the order of magnitude of the solution to a (decimal) calculation * Estimate multiplication calculations that involve multiplying up to four-digit numbers by a two-digit number **N43a** 23-24 * Estimate division calculations that involve dividing up to a four-digit number by a two-digit number **N43b** 23-24   Estimate multiplication calculations that involve multiplying numbers with up to two decimal places by whole numbers **N43a** 23-24  O   * Identify angles that meet at a point **G10a** 169 * Identify angles that meet at a point on a line **G10a** 168 * Identify vertically opposite angles **G18** 172 * Know that vertically opposite angles are equal **G18** 172 * Use known facts to find missing angles **G18, G10a** 169-169, 172 * Explain reasoning 169-169, 172 * Know the angle sum of a triangle **G17** 170-171 * Know that angles in a triangles total 180° **G17** 170-171 * Find missing angles in triangles **G17** 170-171 * Know the angle sum of a quadrilateral **G19** 176-180 * Know how to find the angle sum of any polygon **G19** 180-182 * Use the angle sum of a triangle to find missing angles **G17** 170-171 * Use the angle sum of a quadrilateral to find missing angles 176-180 * Know how to find the size of one angle in any regular polygon **G19** 180-182   P   * Complete tessellations of given shapes **12a** * Construct 3D shapes from given nets **G12c** * Use ‘Polydron’ to construct nets for common 3D shapes * Draw accurate nets for common 3D shapes **G12c** 262-264 * Find all the nets for a cube **G12c** 262-264 * Use a net to visualise the edges (vertices) that will meet when folded **G12c** 262-264 * Use squared paper to guide construction of 2D shapes * Complete tessellations of given shapes **12a** * Know the names of common 3D shapes **G12a**   Use mathematical language to describe 3D shapes **G12a** | Q   * Identify when a comparison problem can be solved using multiplication 161 * Identify when a comparison problem can be solved using division 162 * Identify when a comparison problem requires both division and multiplication 161-167 * Find the value of a single item in a comparison problem 161-167 * Use the value of a single item to solve a comparison problem 161-167 * Use knowledge of fractions to solve a sharing (or grouping) problem161-167   Use knowledge of multiples to solve a sharing (or grouping) problem 161-167  R   * Understand that pie charts are used to show proportions **S9 334-336** * Make statements about proportions shown in a pie charts **S9 334-336** * Make statements to compare proportions in pie charts **S9 334-336** * Use additional information to make statements about frequencies in pie charts **S9334-336** * Use a table of frequencies to work out the angle for a slice in a pie chart **S9** 332-334 * Construct a pie chart by measuring angles **S9** 332-334 * Interpret and construct frequency tables **S9 319-320** * Construct and interpret pictograms (bar charts, tables) and know their appropriate use **S1a, S1b, S2a, S2b 329-330** * Identify the scale used on the axes of a graph * Read values from a line graph involving scaling * Use scaling when constructing line graphs   Answer two-step questions about data in line graphs (e.g. ‘How much more?’)  S   * Understand the meaning of ‘average’ as a typicality (or location) 320- 322 * Understand the mean as a measure of typicality (or location) **S7** * Interpret the mean as a way of levelling the data **S7** 320- 322 * Calculate the mean of a set of data **S7** 320- 322 * Choose an appropriate approximation when required * Use the mean to find a missing number in a set of data **S7 322** * Understand the mode and median as measures of typicality (or location) **S6** 320- 322 * Find the mode of set of data **S6** 320- 322 * Find the median of a set of data **S6** 320- 322 * Find the median of a set of data when there are an even number of numbers in the data set **S6** 320- 322 * Use the mean to find a missing number in a set of data **S7 322**   Calculate the range of a set of data **S6** 320- 322 |
| Assessment | Teacher/Ass. Test  Unit tests | 7.1 EXAM  Unit tests | Teacher/Ass test  Unit tests | 7.2 EXAM  Unit tests | Teacher/Ass test  Unit tests | 7.3 EXAM  Unit tests |
| Why this?  Why now? | Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programme of study for key stage 3 is organised into apparently distinct domains, but pupils should build on key stage 2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge in science, geography, computing and other subjects. The structure is designed to bridge between KS2 and KS4, building both within and between key topic areas. The structure also builds the complexity levels within topics and gives a greater variation in the challenge given to pupils. | | | | | |
| Skills & Characteristics | **Resilience**  Pupils will increase their resilience during the course through learning new concepts, using prior knowledge to develop mathematical fluency and applying skills to a variety of situations and problems. Pupils will be challenged in all lessons and will show that they have learned from mistakes through a variety of tasks including connect exercises. The challenge activities will have the aim of developing both skills and high aspirations in both this subject and life beyond. Resilience will also be developed within the Key maths skills below (fluency, reasoning and problem solving).  **Collaboration**  Pupils will be given the opportunity to work together to develop and share their ideas on topics, discuss misconceptions and how these topics can be used in real-life situations.  **Creativity**  Pupils will develop creativity through a variety of problem solving activities within each topic, working on independent tasks beyond the classroom such as Mangahigh activities, and apply the key skills (fluency, reasoning and problem solving).  **Key stage 3**  **Develop fluency**  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-Dand 3-D shapes, probability and statistics.  **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 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  explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally.  **Solve problems**  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. | | | | | |
| Aspirations & Careers | All pupils should be numerate and able to use mathematics at both work and in everyday life beyond school. Mathematics is fundamental to future success and closely linked with financial success. It enhances their ability to infer, problem solve, think logically, spot patterns as well as navigate through their chosen career with a well-equipped vocabulary. Furthermore, mathematics empowers our pupils to operate in the modern world. CDI: 1, 11  **CEIAG**  AMSP days  Careers Fairs  Career themed lessons  Finance lessons (CDI: 13)  **Cultural Capital**  Maths challenges  Mangahigh challenges  Mathematics in the real world  Organising trips, days out and other events  **Extracurricular**  Stretch and challenge club  Chess & games club | | | | | |

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| **Year 8 Mathematics Curriculum – 2021-22 (**Stage 6 – **STAGE 7** -Stage 8 **)** | | | | | | |
|  | **Autumn Term** | | **Spring Term** | | **Summer Term** | |
|  | **1** | **2** | **1** | **2** | **1** | **2** |
| Key Concepts | A Numbers & the number system.  B Calculating | C Exploring FDP  D Calculating FDP  E Manipulating Algebra  F Solving equations & Inequalities | G Probability  H Sequences  I **Checking, approximating and estimating** | J Measuring Space  K Calculating Space | L Investigating Angles  M Transformations  N Visualising & Constructing | P Proportional reasoning  O Statistics-Graphs  Q Statistics-Averages |
| Knowledge & Understanding  *(National Curriculum)* | A   * Recall prime numbers up to 100 **N30a** * Know how to test if a number up to 150 is prime **N30a** * Know the meaning of ‘highest common factor’ and ‘lowest common multiple’ **N31a, N31b** 38-41­ * Recognise when a problem involves using the highest common factor of two numbers **N31a** 40-41 * Recognise when a problem involves using the lowest common multiple of two numbers **N31b** 39, 41 * Understand the use of notation for powers **N25** * Know the meaning of the square root symbol (√) **N25** 27 * Use a scientific calculator to calculate powers and roots **N44** 28 * Make the connection between squares and square roots (and cubes and cube roots) **N25** 26-27 * Identify the first 10 triangular numbers **A22** * Recall the first 15 square numbers **A22** 26 * Recall the first 5 cube numbers 26   Use linear number patterns to solve problems 129  B   * Use knowledge of place value to multiply with decimals **N15b, N28b** 11-13 * Use knowledge of place value to divide a decimal **N29b** 11 * Use knowledge of place value to divide by a decimal **N29b** 14 - 15 * Use knowledge of inverse operations when dividing with decimals * Be fluent at multiplying a three-digit or a two-digit number by a two-digit number **N28a** 4-5 * Be fluent when using the method of short division **N16** 6-7 * Know the order of operations for the four operations **N20** 15-16 * Use brackets in problem involving the order of operations **N20** 15-16 * Add or subtract from a negative number **N19a** 1-2 * Add (or subtract) a negative number to (from) a positive number **N19a** 2 * Add (or subtract) a negative number to (from) a negative number **N19a** 2 * Multiply with negative numbers **N19b** 2-3 * Divide with negative numbers **N19b** 2-3   Revision from book 17 | C   * Write one quantity as a fraction of another where the fraction is less than 1 **R3** * Write one quantity as a fraction of another where the fraction is greater than 1 **R3** * Write a percentage as a fraction **N32** 73-75, 78   Write a quantity as a percentage of another 73-75  D   * Apply addition to proper fractions, improper fractions and mixed numbers **N35, N36, N41** 44-45, 48-51 * Apply subtraction to proper fractions, improper fractions and mixed numbers **N35, N36, N41** 44-45, 48-51 * Multiply proper and improper fractions **N35, N42a** 51-53 * Multiply mixed numbers **N35, N42a** 53-54 * Apply division to improper fractions and mixed numbers **N35, N42b** 54-56 * Use calculators to find a percentage of an amount using multiplicative methods **N24b** * Identify the multiplier for a percentage increase or decrease **R9b** 81-82 * Use calculators to increase (decrease) an amount by a percentage using multiplicative methods **R9b** 80-82 * Compare two quantities using percentages **N39b** 83 * Know that percentage change = actual change ÷ original amount **109** * Calculate the percentage change in a given situation, including percentage increase / decrease **109** 84-85   E   * Know how to write products algebraically * Use fractions when working in algebraic situations * Identify common factors (numerical and algebraic) of terms in an expression **A9** * Factorise an expression by taking out common factors **A9** 95-96 * Simplify an expression involving terms with combinations of variables (e.g. 3a²b + 4ab2 + 2a2 – a2b)**A6** 90 * Factorising single brackets **A9** 95-96   Expanding quadratic brackets **A18** 96-97  F   * Solve two-step equations (including the use of brackets) when the solution is a fraction **A12** 100-101 * Solve three-step equations (including the use of brackets) when the solution is a whole number **A19a** 101-102 * Solve three-step equations (including the use of brackets) when the solution is a fraction **A19a** 101-102 * Check the solution to an equation by substitution * Solve linear equations with the unknown on one side when the solution is a negative number **A12** 101-102 * Solve linear equations with the unknown on both sides when the solution is a whole number **A19b**  102-104 * Solve linear equations with the unknown on both sides when the solution is a fraction **A19b** 102-104 * Solve linear equations with the unknown on both sides when the solution is a negative number **A19b** 102-104   Solve linear equations with the unknown on both sides when the equation involves brackets **A19b** 102-104 | G   * Know that probability is a way of measuring likeliness **P1**  342 * Know and use the vocabulary of probability **P1** 342-344 * Understand the use of the 0-1 scale to measure probability **P1** 342-344 * Assess likeliness and place events on a probability scale **P1** 342-344 * List all the outcomes for an experiment **P2a** 348-350 * Identify equally likely outcomes **P2a** 344-345 * Work out theoretical probabilities for events with equally likely outcomes **59** 344-345 * Know how to represent a probability * Recognise when it is not possible to work out a theoretical probability for an event * Know that the sum of probabilities for all outcomes is 1   Apply the fact that the sum of probabilities for all outcomes is 1 **P1** 346-347  H   * Use a term-to-term rule to generate a non-linear sequence **37** 127-129 * Find the term-to-term rule for a sequence **37** 127-128 * Solve problems involving the term-to-term rule for a sequence **37** 127-128 * Solve problems involving the term-to-term rule for a non-numerical sequence **37** 129 * Find the position-to-term rule for a given sequence **103** 130-133   Use algebra to describe the position-to-term rule of a linear sequence (the nth term) **103** 130-133  I   * Approximate by rounding to any number of decimal places **N27b** 19-20 * Know how to identify the first significant figure in any number **N38** 21-22 * Approximate by rounding to the first significant figure in any number **N38** 21-22 * Understand estimating as the process of finding a rough value of an answer or calculation 23-24 * Use estimation to predict the order of magnitude of the solution to a (decimal) calculation * Estimate calculations by rounding numbers to one significant figure **N38** 23-24 * Use cancellation to simplify calculations   Use inverse operations to check solutions to calculations | J   * Convert fluently between metric units of length **R2 , 112** 192-194 * Convert fluently between metric units of mass length **R2 , 112** 192-194 * Convert fluently between metric units of volume / capacity length **R2 , 112** 192-194 * Convert fluently between units of * Convert fluently between units of money **N7c** * Solve practical problems that involve converting between units length **R2 , 112** 192-194   State conclusions clearly using the units correctly  K   * Understand how to estimate the area of irregular shapes * Estimate the area of irregular shapes bounded by straight lines or that include curved lines * Recognise that the value of the perimeter can equal the value of area 244-248 * Use standard formulae for area and volume **G9, G20a,G20b, G20c, G20d, G24, G21a, G25a** 244-248, 271-272 * Find missing lengths in 2D shapes when the area is known * Know that the area of a trapezium is given by the formula area = ½ × (a + b) × h = = **G20d** * Calculate the area of a trapezium **G20d** 249-248 * Understand the meaning of surface area * Find the surface area of cuboids (including cubes) when lengths are known **G21b** 275-276 * Find missing lengths in 3D shapes when the volume or surface area is known * Know the vocabulary of circles * Know that the number π (pi) = 3.1415926535… * Recall π to two decimal places * Know the formula circumference of a circle = 2πr = πd **G22a** 252-253 * Calculate the circumference of a circle when radius (diameter) is given **G22a** 252-253 * Calculate the perimeter of composite shapes that include sections of a circle **G22a** 253-255 * Know the formula area of a circle = πr²   Calculate the area of a circle when radius (diameter) is given **G22b** 255-257 | L   * Identify fluently angles at a point, angles at a point on a line and vertically opposite **G10a, G18**168-172 * Identify known angle facts in more complex geometrical diagrams **G18** 168-172 * Use knowledge of angles to calculate missing angles in geometrical diagrams 168-172 * Find the missing angle in an isosceles triangle when only one angle is known **G17** 168-172 * Find missing angles in isosceles triangles **G17** 168-172 * Explain reasoning using vocabulary of angles **G10a** 168-172 * Identify alternate angles and know that they are equal **G18** 173 * Identify corresponding angles and know that they are equal **G18** 174   Use knowledge of alternate and corresponding angles to calculate missing angles in geometrical diagrams **G18** 174-175  M   * Write the equation of a line parallel to the x-axis or the y-axis **A5, A14a, A14b, A14c** 136-137 * Draw a line parallel to the x-axis or the y-axis given its equation 136-137 * Identify the lines **A5** y = x and y = -x * Draw the lines **A5** y = x and y = -x * Carry out a reflection in a diagonal mirror line (45° from horizontal)**G4a, G4b** 283-286 * Find and name the equation of the mirror line for a given reflection 283-286 * Describe a translation as a 2D vector **G5** 290-293 * Understand the concept and language of rotations **G6** 287-290 * Carry out a rotation using a given angle, direction and centre of rotation **G6** 287-290   Describe a rotation using mathematical language **G6** 287-290  N   * Know the meaning of faces, edges and vertices 261 * Use notation for parallel lines * Know the meaning of ‘perpendicular’ and identify perpendicular lines * Know the meaning of ‘regular’ polygons **10** 180 * Identify line and rotational symmetry in polygons **11** 184-186 * Use AB notation for describing lengths * Use ∠ABC notation for describing angles * Use ruler and protractor to construct triangles from written descriptions **47** 232-235   Use ruler and compasses to construct triangles when all three sides known **147** 232-235 | O   * Describe a comparison of measurements or objects using the language ‘a to b’ 63 * Describe a comparison of measurements or objects using ratio notation a:b 63-64 * Use ratio notation to describe a comparison of more than two measurements or objects 63-64 * Convert between different units of measurement State a ratio of measurements in the same units **38** 63-64 * Simplify a ratio by cancelling common factors **R5a** 63-64 * Identify when a ratio is written in its lowest terms **R5a** 63-64 * Find the value of a ‘unit’ in a division in a ratio problem 65 * Divide a quantity in two parts in a given part:part ratio **R5b** 70-71 * Divide a quantity in two parts in a given part:whole ratio **R5b** 69   Express correctly the solution to a division in a ratio problem **R5b** 67-69  P   * Know the meaning of categorical data * Know the meaning of discrete data **63** 310-311 * Construct and interpret comparative bar charts **15** 328-329 * Interpret pie charts and know their appropriate use **128a** 332-336 * Construct pie charts when the total frequency is not a factor of 360 **128a** 332-336 * Choose appropriate graphs or charts to represent data * Construct and interpret vertical line charts **64** * Plot a scatter diagram of bivariate data **129** 338-341 * Understand the meaning of ‘correlation’ **129** 338-341   Interpret a scatter diagram using understanding of correlation **129** 338-341  Q   * Calculate the mean from a frequency table **130a** 323-325 * Find the mode from a frequency table **130a** 323-325 * Find the median from a frequency table **130a** 323-325 * Understand the range as a measure of spread (or consistency) **62** 323-325 * Analyse and compare sets of data 325-326   Appreciate the limitations of different statistics (mean, median, mode, range) **62** |
| Assessment | Teacher/Ass. Test  Unit tests | 8.1 EXAM  Unit tests | Teacher/Ass. Test  Unit tests | 8.2 EXAM  Unit tests | Teacher/Ass. Test  Unit tests | 8.3 EXAM  Unit tests |
| Why this?  Why now? | Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programme of study for key stage 3 is organised into apparently distinct domains, but pupils should build on key stage 2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge in science, geography, computing and other subjects. The structure is designed to bridge between KS2 and KS4, building both within and between key topic areas. The structure also builds the complexity levels within topics and gives a greater variation in the challenge given to pupils. | | | | | |
| Skills & Characteristics | **Resilience**  Pupils will increase their resilience during the course through learning new concepts, using prior knowledge to develop mathematical fluency and applying skills to a variety of situations and problems. Pupils will be challenged in all lessons and will show that they have learned from mistakes through a variety of tasks including connect exercises. The challenge activities will have the aim of developing both skills and high aspirations in both this subject and life beyond. Resilience will also be developed within the Key maths skills below (fluency, reasoning and problem solving).  **Collaboration**  Pupils will be given the opportunity to work together to develop and share their ideas on topics, discuss misconceptions and how these topics can be used in real-life situations.  **Creativity**  Pupils will develop creativity through a variety of problem solving activities within each topic, working on independent tasks beyond the classroom such as Mangahigh activities, and apply the key skills (fluency, reasoning and problem solving).  **Key stage 3**  **Develop fluency**  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-Dand 3-D shapes, probability and statistics.  **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 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  explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally.  **Solve problems**  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. | | | | | |
| Aspirations & Careers | All pupils should be numerate and able to use mathematics at both work and in everyday life beyond school. Mathematics is fundamental to future success and closely linked with financial success. It enhances their ability to infer, problem solve, think logically, spot patterns as well as navigate through their chosen career with a well-equipped vocabulary. Furthermore, mathematics empowers our pupils to operate in the modern world. CDI: 1, 11  **CEIAG**  AMSP days  Careers Fairs  Career themed lessons  Finance lessons (CDI: 13)  **Cultural Capital**  Maths challenges  Mangahigh challenges  Mathematics in the real world  Organising trips, days out and other events  **Extracurricular**  Stretch and challenge club  Chess & games club | | | | | |

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| **Year 9 Mathematics Curriculum – 2022-23 (**Stage 6/7 - **STAGE 8 -** Stage 9**)** | | | | | | |
|  | **Autumn Term** | | **Spring Term** | | **Summer Term** | |
|  | **1** | **2** | **1** | **2** | **1** | **2** |
| Key Concepts | A Numbers & the number system.  B Calculating | C Exploring FDP  D Calculating FDP  E Manipulating Algebra  F Solving equations & Inequalities | G Probability  H Sequences  I Investigating Angles | J Calculating Space  K Visualising & Constructing | L Proportional reasoning 1  M Algebraic graphs  N Statistics-Averages | O Statistics-Graphs  P Proportional reasoning 2 |
| Knowledge & Understanding  *(National Curriculum)* | **A**   * Understand the meaning of prime factor **N30b 36** * Write a number as a product of its prime factors **N30b 36** * Use a Venn diagram to sort information **P6** * Use prime factorisations to find the highest common factor of two numbers **N31a 39-41** * Use prime factorisations to find the lowest common multiple of two numbers **N31b 39-41** * Know how to identify any significant figure in any number **N38 21** * Approximate by rounding to any significant figure in any number **N38 21-22** * Write a large (small) number in standard form **N45a, N45b 32** * Interpret a large (small) number written in standard form **N45a, N45b 32** * Calculate with positive indices (roots) using written methods **N25 32-33**   Calculate with negative indices in the context of standard form **N45a, N45b 32-33**  **B**   * Know how to square (or cube) a negative number **N19b, N25 119-121** * Substitute negative numbers into expressions **A10, N19a, N19b 119-121** * Enter negative numbers into a calculator **N44** * **119-121** * Interpret a calculator display when working with negative numbers **N44** * Understand how to use the order of operations including powers and roots **N20**   Use a calculator to evaluate numerical expressions involving powers (roots) **N44** | **C**   * Identify if a fraction is terminating or recurring **N32 56-59** * Recall some decimal and fraction equivalents (e.g. tenths, fifths, eighths) **N32 57-58** * Write a decimal as a fraction **N32 59** * Write a fraction in its lowest terms by cancelling common factors **N23c 42** * Identify when a fraction can be scaled to tenths or hundredths **N32** * Convert a fraction to a decimal by scaling (when possible) **N32 57-59** * Use a calculator to change any fraction to a decimal **N44 56-57** * Write a decimal as a percentage **N32 77-80**   Write a fraction as a percentage **N32 77-80**  **D**   * Recognise when a fraction (percentage) should be interpreted as a number * Recognise when a fraction (percentage) should be interpreted as a operator * Identify the multiplier for a percentage increase or decrease when the percentage is greater than 100% **R9b 81** * Use calculators to increase an amount by a percentage greater than 100% **R9b 81-82** * Solve problems involving percentage change **109 83-84** * Solve original value problems when working with percentages **110 85** * Solve financial problems including simple interest **111 86-87** * Understand the meaning of giving an exact solution   Solve problems that require exact calculation with fractions  **E**   * Know the multiplication (division, power, zero) law of indices **131** 30-32 * Understand that negative powers can arise **154 higher book pg 68** * Substitute positive and negative numbers into formulae **A10 118-121** * Multiply two linear expressions of the form (x + a)(x + b) **A18 94** * Multiply two linear expressions of the form (x ± a)(x ± b) **A18 94**   Expand the expression (x ± a)2 **A18 94**  **F**   * Be aware of common scientific formulae * Know the meaning of the ‘subject’ of a formula 121 * Change the subject of a formula when one and two steps are required **A13a, A13b 121-124** * Check the solution to an equation by substitution * Understand the meaning of the four inequality symbols **A20a 107** * Choose the correct inequality symbol for a particular situation **A20a 107-108** * Represent practical situations as inequalities * Find the set of integers that are solutions to an inequality **A20a 108-110** * Use set notation to list a set of integers 358 * Use a formal method to solve an inequality with unknowns on both sides **A20b** * Use a formal method to solve an inequality involving brackets **A20b** * Know how to deal with negative number terms in an inequality * Know how to show a range of values that solve an inequality on a number line **138** * Know when to use an open or closed circle at the end of a range of values shown on a number line **138**   Use a number line to find the set of values that are true for two inequalities **138 110-111** | **G**   * List all elements in a combination of sets using a Venn diagram **127a, 127b 358-359** * List outcomes of an event systematically **58** * Use a table to list all outcomes of an event 348-350 * List outcomes of an event using a grid (two-way table) **61** 348-350 * Use frequency trees to record outcomes of probability experiments **57 353-354** * Make conclusions about probabilities based on frequency trees **57 353-354** * Construct theoretical possibility spaces for combined experiments with equally likely outcomes **126** 348-350 * Calculate probabilities using a possibility space **126** 348-350 * Use theoretical probability to calculate expected outcomes **59 352**   Use experimental probability to calculate expected outcomes **125 352**  **H**   * Generate a sequence from a term-to-term rule **A11a 127** * Understand the meaning of a position-to-term rule **A11b 130** * Use a position-to-term rule to generate a sequence **A11b 130-131**   Use the nth term of a sequence to deduce if a given number is in a sequence **A11c, 102 132-133**  **I**   * Identify alternate angles and know that they are equal **G18 173** * Identify corresponding angles and know that they are equal **G18 174** * Use knowledge of alternate and corresponding angles to calculate missing angles in geometrical diagrams **G18 173-175** * Establish the fact that angles in a triangle must total 180° **G17170-171** * Use the fact that angles in a triangle total 180° to work out the total of the angles in any polygon **G19 180-182** * Establish the size of an interior angle in a regular polygon **G19 180-182** * Know the total of the exterior angles in any polygon **G19 182-183**   Establish the size of an exterior angle in a regular polygon **G19 182-183** | **J**   * Calculate the radius (diameter) of a circle when the circumference is known **118** * Calculate the radius (diameter) of a circle when the area is known **117** * Calculate the area of composite shapes that include sections of a circle 256-259 * Know the formula for finding the volume of a right prism (cylinder) **119 263-264** * Calculate the volume of a right prism (cylinder) ) **119 263-264** * Calculate exactly with multiples of π * Know Pythagoras’ theorem **150a, 150b 217-221** * Identify the hypotenuse in a right-angled triangle **150a, 150b 217-221** * Know when to apply Pythagoras’ theorem **150a, 150b 217-221** * Calculate the hypotenuse of a right-angled triangle using Pythagoras’ theorem **150a, 150b 217-221**   Calculate one of the shorter sides in a right-angled triangle using Pythagoras’ theorem **150a, 150b 217-221**  **K**   * Know the vocabulary of enlargement **148 294-299** * Find the centre of enlargement **148 294-299** * Find the scale factor of an enlargement **148 294-299** * Use the centre and scale factor to carry out an enlargement with positive integer (fractional) scale factor **148 294-299** * Know and understand the vocabulary of plans and elevations **51 264-267** * Interpret plans and elevations **51 264-267** * Use the concept of scaling in diagrams **G15 209-212** * Measure and state a specified bearing **124 213-214** * Construct a scale diagram involving bearings **124 215-216** * Use bearings to solve geometrical problems **124 216**   Construct triangles (SSS, SAS, ASA, AAA) **47, 147 232-235** | **L**   * Identify ratio in a real-life context **38 64** * Write a ratio to describe a situation **38 66-67** * Identify proportion in a situation **38, 106 162** * Find a relevant multiplier in a situation involving proportion **38, 106 161** * Use fractions fluently in situations involving ratio or proportion **38, 106 161-167** * Understand the connections between ratios and fractions **10767-68** * Recognise a graph that illustrates direct proportion **42,199 161-167**   Recognise a graph that illustrates inverse proportion **42,199 161-167**  **M**   * Plot graphs of functions of the form y = mx + c (x ± y = c, ax ± by = c) **159a, 159b 138-139** * Understand the concept of the gradient of a straight line **97, 159a, 159b 140-141** * Find the gradient of a straight line on a unit grid **159b 140-142 143** * Find the y-intercept of a straight line **159a, 159b 143** * Find the equation of a line through one point with a given gradient **159a, 159b143-144** * Find the equation of a line through two given points **159a, 159b 145** * Sketch a linear graph **96 143-145** * Distinguish between a linear and quadratic graph **96, 98** * Plot graphs of quadratic functions of the form y = x2 ± c **98 146-148** * Sketch a simple quadratic graph **98** * Plot and interpret graphs of piece-wise linear functions in real contexts 155-156   Plot and interpret distance-time graphs (speed-time graphs) **216a 205-208**  **N**   * Find the modal class of set of grouped data **130a, 130b 323-325** * Find the class containing the median of a set of data **130a, 130b 323-325** * Find the midpoint of a class **130a, 130b 323-325** * Calculate an estimate of the mean from a grouped frequency table **130b 323-325** * Estimate the range from a grouped frequency table **130a, 130b** **323-325** * Analyse and compare sets of data 326 * Appreciate the limitations of different statistics (mean, median, mode, range) **62** * Choose appropriate statistics to describe a set of data   Justify choice of statistics to describe a set of data | **O**   * Know the meaning of continuous data **63 310-311** * Interpret a grouped frequency table for continuous data **65a 313-314** * Construct a grouped frequency table for continuous data **65a 313-314** * Construct histograms for grouped data with equal class intervals **205 in higher book for unequal** * Interpret histograms for grouped data with equal class intervals **205 313-314**   Construct and use the horizontal axis of a histogram correctly **205 313-314**  **P**   * Understand the meaning of a compound unit **142 201-203** * Know the connection between speed, distance and time **142 201-203** * Solve problems involving speed **142 201-203**   Identify when it is necessary to convert quantities in order to use a sensible unit of measure **142 201-203** |
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