City of *Derby Academy*

Medium Term Plans: *Mathematics*

Included in this document:

1. *An **overview** of the mathematics **curriculum**, **qualifications** and **certificates** offered*
2. *Details regarding **Entry Level Certificate***
3. ***Autumn Term** Stage Map*
4. *Exam Preparation and Revision Timetable (**Past example**)*

Overview:

*The mathematics **curriculum**, **qualifications** and **certificates***

ELC ***Support***	We allow some students to study ***Entry Level Certificate***. The lessons for this course are fully integrated into students' main lessons; additional lessons can be provided for catch up as well. Students sit an ELC exam and well as an AQA GCSE exam. ***More information is** given later in this document**.***
Stage (GCSE) ***Appropriate challenge, ambition** and **accessibility for all***	To guarantee ***appropriate challenge, ambition*** and ***accessibility;*** students study stages ***relevant to their needs.*** Teachers link lessons to future/prior stages (where applicable) See the ***Autumn Term Stage Map***; given on the following pages.
Y11 Revision ***Preparation***	*After the Autumn Term, we will be moving to **examination preparation / revision style lessons.*** *This worked **particularly well** at moving students forward with their **grades in their summer 2024 results.*** *An example of a **revision plan** is given on the **following pages.***

AQA

*E*ntry *L*evel *C*ertificate

Entry Level Certificate *Breakdown of Components*

Component 1: properties of number

3.1 Read and write numbers up to 1000
3.2 Order and compare numbers up to 1000
3.3 Recognise place value in 3-digit numbers
3.4 Round numbers less than 1000 to the nearest 10
3.5 Round numbers to the less than 1000 to the nearest 100
3.6 Find 10 or 100 more or less than a given number
3.7 Recognise and use multiples of 2, 3, 4, 5, 8, 10, 50, 100

Component 2: the four operations

3.1 Add and subtract using 3-digit numbers
3.2 Multiply a 2-digit whole number by a single digit whole number
3.3 Divide a 2-digit whole number by a single digit whole number
3.4 Use and interpret +, -, ×, ÷ and = in real-life situations to solve problems
3.5 Use inverse operations to find missing answers
3.6 Estimate the answer to a calculation
3.7 Recall and use multiplication facts for the 3, 4 and 8 multiplication tables

Component 3: ratio

3.1 Identify or show unit fractions up to one tenth of a quantity up to 100
3.2 Work out unit fractions to one tenth of a number up to 100
3.3 Identify or show any number of thirds, quarters, fifths or tenths of a quantity
3.4 Work out any number of thirds, quarters, fifths or tenths of an amount
3.5 Recognise and identify equivalent fractions
3.6 Add and subtract with the same denominator within one whole
3.7 Work out amounts 5, 8, or 10 times the size of a given amount

Component 4: money

3.1 Appreciate the purchasing power of amounts of money (notes)
3.2 Exchange notes for an equivalent value in coins
3.3 Use decimal notation for money
3.4 Interpret a calculator display
3.5 Solve real life problems involving what to buy and how to pay
3.6 Add amounts of money and give change
3.7 Carry out investigations involving money

Entry Level Certificate *Breakdown of Components*

Component 5: the calendar and time

3.1 Solve problems involving time
3.2 Know that there are 365 days in a year, 366 days in a leap year, 12 months in a year and 52 full weeks in a year
3.3 Use a calendar and write the date correctly (day/month/year)
3.4 Tell and write the time from an analogue clock, including using Roman numerals from I to XII
3.5 Understand and use the 12-hour and 24-hour clock systems and convert from one system to the other
3.6 Convert between hours, minutes and seconds
3.7 Add up to three lengths of time given in minutes and hours

Component 6: measures

3.1 Add lengths, capacities and weights and compare the total to another total or a requirement
3.2 Convert standard units of length, capacity and weight
3.3 Compare and order lengths, capacities and weights in different standard units
3.4 Measure the perimeter of a simple shape
3.5 Choose an appropriate measuring instrument
3.6 Read values from an appropriate scale
3.7 Read and compare temperatures including temperatures with negative values

Component 7: geometry

3.1 Recognise and name prisms, cylinders and cones
3.2 Draw lines of symmetry on shapes or pictures
3.3 Recognise and draw nets of cubes and cuboids
3.4 Identify whether an angle is less or more than a right angle
3.5 Identify horizontal, vertical and parallel lines
3.6 Denote the position of a point by its coordinates or identify a point or item given its coordinates
3.7 Use North (N), East (E), South (S), and West (W) to give directions or positions from a map

Component 8: statistics

3.1 Construct and interpret bar charts with the vertical axis scaled in ones or twos
3.2 Construct and interpret pictograms where one picture represents more than one item
3.3 Extract numerical information from lists, tables, diagrams and charts
3.4 Complete a frequency table given the original list of results
3.5 Complete a tally chart and the resulting frequency table
3.6 Compare two or more diagrams
3.7 Solve one-step and two-step problems based on statistical information

Autumn Term Stage Map

Autumn Term Stage Map *(to be updated each Term)*

Year	Classes	HT1 ST	HT1 End	HT2 ST	HT2 End
7	7a/Ma1, 7a/Ma2, 7b/Ma1, 7b/Ma2	ST7 1	ST7 4	ST7 5	ST7 9
7	7a/Ma3, 7b/Ma3	ST7 1	ST7 3	ST7 3 & 4	ST7 7
7	7a/Ma4	ST6 1	ST6 4	ST6 4	ST6 6
7	7b/Ma4	ST5 1	ST5 4	ST5 4 & 5	ST5 7
8	8ab/Ma1	ST8 3	ST8 6 & 7	ST8 7	ST8 10 & 11
8	8ab/Ma2	ST7 15	ST7	ST7 1	ST8 3
8	8ab/Ma3	ST7 15	ST7 INT	ST8 1	ST8 3
8	8ab/Ma4	ST713	ST7 15	ST7 16	ST7 INT
8	8ab/Ma5	ST7 13	ST7 15	ST7 16	ST7 INT
8	8ab/Ma6	ST7 9	ST7 13	ST7 13	ST7 15
8	8ab/Ma7	ST6 10 & 11	ST6 13	ST6 13	ST6 15
8	8ab/Ma8	ST6 1	ST6 T1B	ST6 4	ST6 5 & 6
9	9ab/Ma1	ST8 INT	ST9 1	ST9 1	ST9 3
9	9ab/Ma2	ST8 12	ST8 15	ST8 16	ST9 1
9	9ab/Ma3	ST8 9 & 10	ST8 13	ST8 13	ST8 16
9	9ab/Ma4	ST8 4 & 5	ST8 7 & 8	ST8 8	ST8 11
9	9ab/Ma5	ST8 3	ST8 5	ST8 6	ST8 9
9	9ab/Ma6	ST8 3 & 4	ST8 6 & 7	ST8 7	ST8 9 & 10
9	9ab/Ma7	ST6 16 & 17	ST7 1	ST7 1 & 2	ST7 3 & 4
9	9ab/Ma8	ST6 1	ST6 3	ST6 4	ST6 5 & 6
10	10ab/Ma1	ST9 9	ST9 11	ST9 12	ST10 2
10	10ab/Ma2	ST9 9	ST9 11	ST9 12	ST10 12
10	10ab/Ma3	ST8 14 & 15	ST9 1	ST9 1	ST9 3
10	10ab/Ma4	ST8 14	ST9 1	ST9 1	ST9 3
10	10ab/Ma5	ST8 12	ST8 14	ST8 15	ST8 INT
10	10ab/Ma6	ST8 6 & 7	ST8 10	ST8 10 & 11	ST8 12
10	10ab/Ma7	ST7 5 & 6	ST7 9	ST7 9	ST7 13
10	10ab/Ma8	ST6 6	ST6 9	ST6 11	ST6 12
11	11ab/Ma1	ST10 10 & 11	ST10 14	ST10 15	ST10 INT
11	11ab/Ma2	ST10 3	ST10 8	ST10 8	ST10 12
11	11ab/Ma3	ST9 10	ST9 INT & 1	ST10 1	ST10 4
11	11ab/Ma4	ST9 7	ST9 9	ST9 9	ST9 11
11	11ab/Ma5	ST9 3	ST9 5	ST9 6	ST9 7
11	11ab/Ma6	ST8 13	ST8 INT	ST9 1	ST9 2
11	11ab/Ma7	ST8 1	ST8 3	ST8 4	ST8 5
11	11ab/Ma8	ST6 10 & 11	ST6 12	ST6 13	ST6 15

Key:

- Stage 6 Unit 13 would read **ST6 13**
- Stage 6 Unit 13 & 14 would read **ST6 13 & 14**
- Stage 6 Unit Intervention (Completed at the end of stages) would read **ST6 INT**

Stages **and** ***Units***

Breakdown

***Stage 10 *Light* contains *less* units than Stage 10**

****Only *11AB/MA1* study *Stage 10*; other classes study Stage 10 Light**

Stage 5: *Unit Lists & Unit Amplification*

Unit Lists:

1) Numbers & the Number System
2) Counting & Comparing
3) Calculating - + & -
4) Visualising & Constructing
5) Calculating - × & ÷
6) Investigating Properties of Shapes
7) Exploring Fractions, Decimals & Percentages
8) Measuring Space
9) Investigating Angles
10) Fractions, Decimals & Percentages
11) Calculating Space
12) Checking, Approximating & Estimating
13) Mathematical Movement
14) Counting & Comparing II
15) Exploring Time
16) Presentation of Data

Unit	Stage 5 Unit Amplification
1	Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. Establish whether a number up to 100 is prime and recall prime numbers up to 19. Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}). Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes. **Mathematical Language:** Multiple (Common) factor Divisible Factor pairs Prime number Composite number Square number Cube number Power **Notation** 5^2 is read as '5 to the power of 2' or '5 squared' and means '2 lots of 5 multiplied together' 5^3 is read as '5 to the power of 3' or '5 cubed' and means '3 lots of 5 multiplied together'
2	Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit. Read Roman numerals to 1000 (M) and recognise years written in Roman numerals. Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero. **Mathematical Language:** Place value Digit Roman numerals Negative number **Notation** Notes about Roman numerals - Note that we use Arabic numerals today! Choose a number and convert it instantly. Can pupils work out the system for numbers above 100?
3	Add and subtract numbers mentally with increasingly large numbers. Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction). Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. **Mathematical Language:** Addition Subtraction Sum Total Difference Minus Less Column addition Column subtraction Exchange Operation Estimate

Unit	Stage 5 Unit Amplification
4	Identify 3-D shapes, including cubes and other cuboids, from 2-D representations. **Mathematical Language:** Cube Cuboid Cylinder Pyramid Prism Cone Sphere 2D 3D Net Sketch Isometric paper
5	Multiply and divide numbers mentally drawing upon known facts. Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers. Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context. Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes. Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign. **Mathematical Language:** Multiply Multiplication Times Product Commutative Divide Division Divisible Divisor Dividend Quotient Remainder Factor Short multiplication Long multiplication Short division Operation Estimate **Notation** Remainders are often abbreviated to 'r' or 'rem'
6	Use the properties of rectangles to deduce related facts and find missing lengths and angles. Distinguish between regular and irregular polygons based on reasoning about equal sides and angles. **Mathematical Language:** Rectangle Square Quadrilateral (Regular / irregular) polygon pentagon hexagon octagon (Right) angle Parallel Perpendicular Coordinates **Notation** Dash notation to represent equal lengths in shapes and geometric diagrams Right angle notation (Cartesian) coordinates
7	Compare and order fractions whose denominators are all multiples of the same number. Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths. Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. Read and write decimal numbers as fractions [for example, 0.71 = 71/100]. Read, write, order and compare numbers with up to three decimal places. Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal. **Mathematical Language:** Fraction Numerator Denominator Improper fraction Proper fraction Vulgar fraction Top-heavy fraction Tenth hundredth thousandth Per cent Percentage Decimal Equivalent **Notation** Diagonal fraction bar / horizontal fraction bar
8	Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre). Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints. Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. **Mathematical Language:** Length distance Mass weight Volume Capacity Metre centimetre millimetre Kilogram gram Litre millilitre Hour minute second Inch foot yard Pound ounce Pint gallon **Notation** Abbreviations of units in the metric system: m, cm, mm, kg, g, l, ml Abbreviations of units in the Imperial system: lb, oz

9	Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles Draw given angles, and measure them in degrees (°). Identify: angles at a point and one whole turn (total 360°); angles at a point on a straight line and 1/2 a turn (total 180°); other multiples of 90°. **Mathematical Language:** Turn Angle Degrees Right angle Acute angle Obtuse angle Reflex angle Protractor **Notation** Right angle notation Arc notation for all other angles The degree symbol (°)
10	Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, 2/5 + 4/5 = 6/5 = 1 1/5]. Add and subtract fractions with the same denominator and denominators that are multiples of the same number. Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. Solve problems which require knowing percentage and decimal equivalents of 1/2, 1/4, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25. Solve problems involving number up to three decimal places. **Mathematical Language:** Place value Tenth hundredth thousandth Decimal Proper fraction Improper fraction top-heavy fraction Vulgar fraction Numerator denominator Percent percentage **Notation** Decimal point t, h, th notation for tenths, hundredths, thousandths Horizontal / diagonal bar for fractions
11	Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes Estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes)] and capacity [for example, using water] **Mathematical Language:** Perimeter Area Volume Capacity Dimensions Square rectangle Composite rectilinear Polygon Cube cuboid Millimetre Centimetre Metre Kilometre Square centimetre square metre Cubic centimetre centimetre cube Square unit **Notation** Abbreviations of units in the metric system: km, m, cm, mm, cm^2, m^2, cm^3
12	Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000. Round decimals with two decimal places to the nearest whole number and to one decimal place. Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. **Mathematical Language:** Approximate (noun and verb) Round Decimal place Check Solution Answer Estimate (noun and verb) Accurate Accuracy **Notation** The approximately equal symbol (≈)
13	Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed. **Mathematical Language:** 2-D Grid Axis axes x-axis y-axis Origin (First) quadrant (Cartesian) coordinates Point Translation Reflection Transformation Object Image Congruent congruence **Notation** Cartesian coordinates should be separated by a comma and enclosed in brackets (x, y)

Unit	Stage 5 Unit Amplification
14	Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000. **Mathematical Language:** Forwards Backwards Ascending Descending Pattern Sequence
15	Solve problems involving converting between units of time. Complete, read and interpret information in tables, including timetables. **Mathematical Language:** Millennium Century Decade Year Month Week Day Hour Minute Second Timetable **Notation** 12- and 24-hour clock notation 24-hour clock notation can be with or without a colon separating hours and minutes Analogue clocks with Arabic or Roman numerals
16	Solve comparison, sum and difference problems using information presented in a line graph **Mathematical Language:** Data Scale Axis Graph Frequency Time graph Time series Line graph Bar-line graph vertical line chart Maximum minimum

Stage 6: *Unit Lists & Unit Amplification*

Unit Lists:

1. Numbers & the Number System
2. Checking, Approximating & Estimating
3. Calculating
4. Calculating: Division
5. Visualising & Constructing
6. Investigating Properties of Shapes
7. Algebraic Proficiency: Using Formulae
8. Exploring Fractions, Decimals & Percentages
9. Proportional Reasoning
10. Pattern Sniffing
11. Measuring Space
12. Investigating Angles
13. Calculating Fractions, Decimals & Percentages
14. Solving Equations & Inequalities
15. Calculating Space
16. Mathematical Movement
17. Presentation of Data
18. Measuring Data

Unit	Stage 6 Unit Amplification
1	Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places. Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit. Use negative numbers in context, and calculate intervals across zero. Identify common factors, common multiples and prime numbers. **Mathematical Language:** Place value Digit Negative number (Common) multiple (Common) factor Divisible Prime number Composite number
2	Solve problems which require answers to be rounded to specified degrees of accuracy. Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. Round any whole number to a required degree of accuracy. **Mathematical Language:** Approximate (noun and verb) Round Decimal place Check Solution Answer Estimate (noun and verb) Order of magnitude Accurate Accuracy **Notation** The approximately equal symbol (≈)

3	Perform mental calculations, including with mixed operations and large numbers. Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. Solve problems involving addition, subtraction and multiplication. Use their knowledge of the order of operations to carry out calculations. **Mathematical Language:** Addition Subtraction Sum Total Difference Minus Less Column addition Column subtraction Operation Multiply MultiplicationTimes Product Commutative Factor Short multiplication Long multiplication Estimate
4	Use written division methods in cases where the answer has up to two decimal places. Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division; interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. Solve problems involving division. Use their knowledge of the order of operations to carry out calculations involving the four operations. **Mathematical Language:** Commutative Divide Division Divisible Divisor Dividend Quotient Remainder Factor Short division Long division Remainder Operation Estimate **Notation** Remainders are often abbreviated to 'r' or 'rem'
5	Draw 2-D shapes using given dimensions and angles. Recognise, describe and build simple 3-D shapes, including making nets. **Mathematical Language:** Protractor Measure Nearest Construct Sketch Cube Cuboid Cylinder Pyramid Prism Net Edge Face Vertex (Vertices) Visualise **Notation** Dash notation to represent equal lengths in shapes and geometric diagrams Right angle notation
6	Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons. Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. **Mathematical Language:** Quadrilateral Square Rectangle Parallelogram (Isosceles) Trapezium Kite Rhombus Delta Arrowhead Triangle Scalene Right-angled Isosceles Equilateral Polygon Regular Irregular Pentagon Hexagon Octagon Decagon Dodecagon Circle Radius Diameter Circumference Centre Parallel Diagonal Angle **Notation** Dash notation to represent equal lengths in shapes and geometric diagrams Right angle notation
7	Use simple formulae. Convert between miles and kilometres. **Mathematical Language:** Formula Formulae Expression Variable Substitute Symbol Mile Kilometre Metric Imperial **Notation** When written algebraically a formula should not include any units.
8	Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. Compare and order fractions, including fractions > 1. Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 3/8]. Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. **Mathematical Language:**Fraction Improper fraction Proper fraction Vulgar fraction Top-heavy fraction Percentage Decimal Proportion Simplify Equivalent Lowest terms **Notation** Diagonal fraction bar / horizontal fraction bar

9	Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. Solve problems involving similar shapes where the scale factor is known or can be found. Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. **Mathematical Language:** Proportion Quantity Integer Similar (shapes) Enlargement Scale factor Group Share Multiples
10	Generate and describe linear number sequences. **Mathematical Language:** Pattern Sequence Linear Term Ascending Descending
11	Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places. **Mathematical Language:** Length distance Mass weight Volume Capacity Metre, centimetre, millimetre Tonne kilogram gram milligram Litre millilitre Hour minute second Inch foot yard Pound ounce Pint gallon **Notation** Abbreviations of units in the metric system: m, cm, mm, kg, g, l, ml Abbreviations of units in the Imperial system: lb, oz
12	Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. **Mathematical Language:** Angle Degrees Right angle Acute angle Obtuse angle Reflex angle Protractor Vertically opposite **Notation** Right angle notation Arc notation for all other angles The degree symbol (°)
13	Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions. Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, 1/4 × 1/2 = 1/8]. Divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6]. Mathematical Language: Multiply one-digit numbers with up to two decimal places by whole numbers. Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison. **Mathematical Language:** Mixed number Equivalent fraction Simplify cancel Lowest terms Proper fraction Improper fraction top-heavy fraction Vulgar fraction Numerator denominator Percent percentage **Notation** Mixed number notation Horizontal / diagonal bar for fractions
14	Enumerate possibilities of combinations of two variables. Express missing number problems algebraically. Find pairs of numbers that satisfy an equation with two unknowns. **Mathematical Language:** Algebra algebraic algebraically Symbol Expression Variable Substitute Equation Unknown Enumerate **Notation** The lower case and upper case of a letter should not be used interchangeably when worked with algebra Juxtaposition is used in place of '×'. 2a is used rather than a2. Division is written as a fraction

15	Recognise that shapes with the same areas can have different perimeters and vice versa calculate the area of parallelograms and triangles. Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3]. Recognise when it is possible to use formulae for area and volume of shape. Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. **Mathematical Language:** Perimeter area volume capacity Square rectangle parallelogram triangle Composite rectilinear Polygon Cube cuboid Millimetre Centimetre Metre Kilometre Square millimetre square centimetre square metre square kilometre Cubic centimetre centimetre cube Formula formulae Convert Length breadth depth height width **Notation** Abbreviations of units in the metric system: km, m, cm, mm, mm^2, cm, m^2, km^2, mm^3, cm^3, km^3
16	Describe positions on the full coordinate grid (all four quadrants). Draw and translate simple shapes on the coordinate plane, and reflect them in the axes. **Mathematical Language:** 2-D Grid Axis axes x-axis y-axis Origin Quadrant (Cartesian) coordinates Point Translation Reflection Transformation Object Image Congruent congruence **Notation** Cartesian coordinates should be separated by a comma and enclosed in brackets (x, y)
17	Interpret and construct pie charts and line graphs and use these to solve problems. **Mathematical Language:** Data Scale Axis axes Graph Frequency Time graph Time series Line graph Pie chart Sector Angle Protractor Degrees Maximum minimum
18	Calculate and interpret the mean as an average. **Mathematical Language:** Average Mean Measure Data Statistic Statistics Approximate Round

Stage 7: *Unit Lists & Unit Amplification*

Unit Lists:

1. Numbers & the Number System
2. Calculating
3. Checking, Approximating & Estimating
4. Counting & Comparing
5. Visualising & Constructing
6. Investigating Properties of Shapes
7. Algebraic Proficiency: Tinkering
8. Exploring Fractions, Decimals & Percentages
9. Proportional Reasoning
10. Pattern Sniffing
11. Measuring Space
12. Investigating Angles
13. Calculating Fractions, Decimals & Percentages
14. Solving Equations & Inequalities
15. Calculating Space
16. Mathematical Movement
17. Presentation of Data
18. Measuring Data

Unit	Stage 7 Unit Amplification
1	Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple. Use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5. Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions. **Mathematical Language:** ((Lowest) common) multiple and LCM ((Highest) common) factor and HCF Power (Square and cube) root Triangular number Square number Cube number Prime number Linear sequence Arithmetic sequence **Notation** Index notation: e.g. 53 is read as '5 to the power of 3' and means '3 lots of 5 multiplied together' Radical notation: e.g. √49 is generally read as 'the square root of 49' and means 'the positive square root of 49'; 3√8 means 'the cube root of 8'
2	Understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals). Apply the four operations, including formal written methods, to integers and decimals. Use conventional notation for priority of operations, including brackets. Recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions). **Mathematical Language:** Improper fraction Top-heavy fraction Mixed number Operation Inverse Long multiplication Short division Long division Remainder

3	Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures). Estimate answers; check calculations using approximation and estimation, including answers obtained using technology. Recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions). **Mathematical Language:** Approximate (noun and verb) Round Decimal place Check Solution Answer Estimate (noun and verb) Order of magnitude Accurate Accuracy Significant figure Cancel Inverse Operation **Notation** The approximately equal symbol (≈) Significant figure is abbreviated to 's.f.' or 'sig fig'
4	Order positive and negative integers, decimals and fractions. Use the symbols =, ≠, <, >, ≤, ≥ **Mathematical Language:** Positive number Negative number Integer Numerator Denominator **Notation** The 'equals' sign: = The 'not equal' sign: ≠ The inequality symbols: < (less than), > (greater than), ≤ (less than or equal to), ≥ (more than or equal to)
5	Use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries. Use the standard conventions for labelling and referring to the sides and angles of triangles. Draw diagrams from written description. **Mathematical Language:** Edge Face Vertex (Vertices) Plane Parallel Perpendicular Regular polygon Rotational symmetry **Notation** The line between two points A and B is AB The angle made by points A, B and C is ∠ABC The angle at the point A is Â Arrow notation for sets of parallel lines Dash notation for sides of equal length
6	Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres. Derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language. **Mathematical Language:** Face Edge Vertex (Vertices) Cube Cuboid Prism Cylinder Pyramid Cone Sphere Quadrilateral Square Rectangle Parallelogram (Isosceles) Trapezium Kite Rhombus Delta Arrowhead Diagonal Perpendicular Parallel Triangle Scalene Right-angled Isosceles Equilateral **Notation** Dash notation to represent equal lengths in shapes and geometric diagrams Right angle notation
7	Understand and use the concepts and vocabulary of expressions, equations, formulae and terms. Use and interpret algebraic notation, including: ab in place of a × b, 3y in place of y + y + y and 3 × y, a^2 in place of a × a, a^3 in place of a × a × a, a/b in place of a ÷ b, brackets. Simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket. Where appropriate, interpret simple expressions as functions with inputs and outputs. Substitute numerical values into formulae and expressions. Use conventional notation for priority of operations, including brackets. **Mathematical Language:** Algebra Expressio Term Formula (formulae) Equation Function Variable Mapping diagram Input Output Represent Substitute Evaluate Like terms Simplify / Collect **Notation** ab in place of a × b, 3y in place of y + y + y and 3 × y, a^2 in place of a × a, a^3 in place of a × a × a, a/b in place of a ÷ b, brackets.

8	Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1. Define percentage as 'number of parts per hundred'. Express one quantity as a percentage of another. **Mathematical Language**: Fraction Improper fraction Proper fraction Vulgar fraction Top-heavy fraction Percentage Proportion **Notation** Diagonal fraction bar / horizontal fraction bar
9	Use ratio notation, including reduction to simplest form. Divide a given quantity into two parts in a given part:part or part:whole ratio. **Mathematical Language:** Ratio Proportion Compare comparison Part Simplify Common factor Cancel Lowest terms Unit **Notation** Ratio notation a:b for part:part or part:whole
10	Generate terms of a sequence from a term-to-term rule. **Mathematical Language**: Pattern Sequence Linear Term Term-to-term rule Ascending Descending
11	Use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.). Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate. Change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts. Measure line segments and angles in geometric figures. **Mathematical Language:** Length distance Mass weight Volume Capacity Metre centimetre millimetre Tonne kilogram gram milligram Litre millilitre Hour minute second Inch foot yard Pound ounce Pint gallon Line segment **Notation** Abbreviations of units in the metric system: m, cm, mm, kg, g, l, ml Abbreviations of units in the Imperial system: lb, oz
12	Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles. **Mathematical Language:** Angle Degrees Right angle Acute angle Obtuse angle Reflex angle Protractor Vertically opposite Geometry geometrical **Notation** Right angle notation Arc notation for all other angles The degree symbol (°)
13	Apply the four operations, including formal written methods, to simple fractions (proper and improper), and mixed numbers. Interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively. Compare two quantities using percentages. Solve problems involving percentage change, including percentage increase/decrease. **Mathematical Language:** Mixed number Equivalent fraction Simplify cancel lowest terms Proper fraction improper fraction top-heavy fraction vulgar fraction Percent percentage Multiplier Increase decrease **Notation** Mixed number notation Horizontal / diagonal bar for fractions
14	Recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions). Solve linear equations in one unknown algebraically. **Mathematical Language:** Algebra algebraic algebraically Unknown Equation Operation Solve Solution Brackets Symbol Substitute **Notation** The lower case and upper case of a letter should not be used interchangeably when worked with algebra Juxtaposition is used in place of '×'. 2a is used rather than a2. Division is written as a fraction

15	Use standard units of measure and related concepts (length, area, volume/capacity). Calculate perimeters of 2D shapes. Know and apply formulae to calculate area of triangles, parallelograms, trapezia. Calculate surface area of cuboids. Know and apply formulae to calculate volume of cuboids. Understand and use standard mathematical formulae. **Mathematical Language:** Perimeter area volume capacity surface area Square rectangle parallelogram triangle trapezium (trapezia) Polygon Cube cuboid Square millimetre square centimetre square metre square kilometre Cubic centimetre centimetre cube Formula formulae Length breadth depth height width **Notation** Abbreviations of units in the metric system: km, m, cm, mm, mm^2, cm^2, m^2, km^2, mm^3, cm^3, km^3
16	Work with coordinates in all four quadrants. Understand and use lines parallel to the axes, y = x and y = -x. Solve geometrical problems on coordinate axes. Identify, describe and construct congruent shapes including on coordinate axes, by considering rotation, reflection and translation. Describe translations as 2D vectors. **Mathematical Language:** (Cartesian) coordinates Axis axes x-axis y-axis Origin Quadrant Translation Reflection Rotation Transformation Object Image Congruent, congruence Mirror line Vector Centre of rotation **Notation** Cartesian coordinates should be separated by a comma and enclosed in brackets (x, y) Vector notation $\binom{a}{b}$ where a = movement right and b = movement up
17	Interpret and construct for categorical data, tables, charts and diagrams, including: Frequency tables; Pictograms; Bar charts; Pie charts; Vertical line graphs. **Mathematical Language:** Data Categorical data Discrete data Pictogram Symbol Key Frequency Table, Frequency table Tally Bar chart Time graph Time series Bar-line graph Vertical line chart Scale Graph Axis axes Line graph Pie chart Sector Angle Maximum minimum **Notation** When tallying, groups of five are created by striking through each group of four
18	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean and mode) and spread (range). **Mathematical Language:** Average Spread Consistency Mean Median Mode Range Measure Data Statistic Statistics Approximate Round

Stage 8: *Unit Lists & Unit Amplification*

Unit Lists:

1. Numbers & the Number System
2. Calculating
3. Visualising & Constructing
4. Understanding Risk I
5. Algebraic Proficiency: Tinkering
6. Exploring Fractions, Decimals & Percentages
7. Proportional Reasoning
8. Sequences & Patterns
9. Investigating Angles
10. Calculating Fractions, Decimals & Percentages
11. Solving Equations & Inequalities
12. Calculating Space
13. Algebraic Proficiency: Visualising
14. Understanding Risk II
15. Presentation of Data
16. Measuring Data

Unit	Stage 8 Unit Amplification
1	Use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem. Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures). Interpret standard form A × 10n, where 1 ≤ A < 10 and n is an integer. **Mathematical Language:** Prime Prime factor Prime factorisation Product Venn diagram Highest common factor Lowest common multiple Standard form Significant figure **Notation** Index notation: e.g. 53 is read as '5 to the power of 3' and means '3 lots of 5 multiplied together' Standard form (see Key concepts) is sometimes called 'standard index form', or more properly, 'scientific notation'
2	Apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative. Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals. **Mathematical Language:** Negative number Directed number Improper fraction Top-heavy fraction Mixed number Operation Inverse Long multiplication Short division Power Indices Roots

3	Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings. Identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement. Interpret plans and elevations of 3D shapes. Use scale factors, scale diagrams and maps. **Mathematical Language:** Similar Similarity Enlarge enlargement Scaling Scale factor Centre of enlargement Object Image Scale drawing Bearing Plan Elevation **Notation** Bearings are always given as three figures; e.g. 025°. Cartesian coordinates: separated by a comma and enclosed by brackets
4	Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale. Record describe and analyse the frequency of outcomes of probability experiments using tables. Construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities. Apply the property that the probabilities of an exhaustive set of outcomes sum to one. **Mathematical Language:** Probability Theoretical probability Event Outcome Impossible Unlikely Evens chance Likely Certain Equally likely Mutually exclusive Exhaustive Possibility space Experiment **Notation** Probabilities are expressed as fractions, decimals or percentage. They should not be expressed as ratios (which represent odds) or as words
5	Use and interpret algebraic notation, including: a^2b in place of a × a × b, coefficients written as fractions rather than as decimals. Understand and use the concepts and vocabulary of factors. Simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices. Substitute numerical values into scientific formulae. Rearrange formulae to change the subject. **Mathematical Language:** Product Variable Term Coefficient Common factor Factorise Power Indices Formula Formulae Subject Change the subject
6	Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 or 3/8). **Mathematical Language:** Fraction Mixed number Top-heavy fraction Percentage Decimal Proportion Terminating Recurring Simplify Cancel **Notation** Diagonal and horizontal fraction bar
7	Express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations). Identify and work with fractions in ratio problems. Understand and use proportion as equality of ratios. Express a multiplicative relationship between two quantities as a ratio or a fraction. Use compound units (such as speed, rates of pay, unit pricing). Change freely between compound units (e.g. speed, rates of pay, prices) in numerical contexts. Relate ratios to fractions and to linear functions. **Mathematical Language: Ratio Proportion Proportional Multiplier Speed Unitary method Units Compound unit** **Notation** Kilometres per hour is written as km/h or kmh^{-1} Metres per second is written as m/s or ms^{-1}

8	Generate terms of a sequence from either a term-to-term or a position-to-term rule. Deduce expressions to calculate the nth term of linear sequences. **Mathematical Language:** Sequence Linear Term Difference Term-to-term rule Position-to-term rule Ascending Descending **Notation** T(n) is often used when finding the nth term of sequence
9	Understand and use alternate and corresponding angles on parallel lines. Derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons). **Mathematical Language:** Degrees Right angle acute angle obtuse angle reflex angle Vertically opposite Geometry geometrical Parallel Alternate angles corresponding angles Interior angle exterior angle Regular polygon **Notation** Dash notation to represent equal lengths in shapes and geometric diagrams Arrow notation to show parallel lines
10	Interpret fractions and percentages as operators. Work with percentages greater than 100%. Solve problems involving percentage change, including original value problems, and simple interest including in financial mathematics. Calculate exactly with fractions. **Mathematical Language:** Proper fraction improper fraction mixed number Simplify cancel lowest terms Percent percentage Percentage change Original amount Multiplier (Simple) interest Exact **Notation** Mixed number notation Horizontal / diagonal bar for fractions
11	Solve linear equations with the unknown on both sides of the equation. Find approximate solutions to linear equations using a graph **Mathematical Language:** Algebra algebraic algebraically Unknown Equation Operation Solve Solution Brackets Symbol Substitute Graph Point of intersection **Notation** The lower case and upper case of a letter should not be used interchangeably when worked with algebra Juxtaposition is used in place of '×'. 2a is used rather than a2. Division is written as a fraction
12	Compare lengths, areas and volumes using ratio notation. Calculate perimeters of 2D shapes, including circles. Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference. Know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2 Calculate areas of circles and composite shapes Know and apply formulae to calculate volume of right prisms (including cylinders) **Mathematical Language:** Circle Centre Radius diameter chord circumference Pi (Right) prism Cross-section Cylinder Polygon polygonal Solid **Notation** π Abbreviations of units: km, m, cm, mm, mm^2, cm^2, m^2, km^2, mm^3, cm^3, km^3

13	Plot graphs of equations that correspond to straight-line graphs in the coordinate plane. Identify and interpret gradients and intercepts of linear functions graphically. Recognise, sketch and interpret graphs of linear functions and simple quadratic functions. Plot and interpret graphs and graphs of non-standard (piece-wise linear) functions in real contexts, to find approximate solutions to problems such as simple kinematic problems. Involving distance and speed. **Mathematical Language:** Plot Equation (of a graph) Function Formula Linear Coordinate plane Gradient y-intercept Substitute Quadratic Piece-wise linear Model Kinematic Speed Distance
14	Apply systematic listing strategies. Record describe and analyse the frequency of outcomes of probability experiments using frequency trees. Enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities. Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments. **Mathematical Language:** Outcome Event Experiment Combined experiment Frequency tree Enumerate Set Venn diagram Possibility space sample space Equally likely outcomes Theoretical probability Random Bias Fairness Relative frequency **Notation** P(A) for the probability of event A Probabilities are expressed as fractions, decimals or percentage. They should not be expressed as ratios (which represent odds) or as words
15	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data. Use and interpret scatter graphs of bivariate data. Recognise correlation. **Mathematical Language:** Data Categorical data Discrete data Continuous data Grouped data Table Frequency table Frequency Histogram Scale Graph Axis axes Scatter graph (scatter diagram, scattergram, scatter plot) Bivariate data (Linear) Correlation Positive correlation Negative correlation **Notation** Correct use of inequality symbols when labeling groups in a frequency table
16	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers). Apply statistics to describe a population. **Mathematical Language:** Average Spread Consistency Mean Median Mode Range Statistic Statistics Approximate Round Calculate an estimate Grouped frequency Midpoint **Notation** Correct use of inequality symbols when labeling groups in a frequency table

Stage 9: *Unit Lists & Unit Amplification*

Unit Lists:

1. Calculating
2. Visualising & Constructing
3. Algebraic Proficiency: Tinkering
4. Proportional Reasoning
5. Pattern Sniffing
6. Solving Equations & Inequalities I
7. Calculating Space
8. Conjecturing
9. Algebraic Proficiency: Visualising
10. Solving Equations & Inequalities II
11. Understanding Risk
12. Presentation of Data

Unit	Stage 9 Unit Amplification
1	Calculate with roots, and with integer indices. Calculate with standard form $A \times 10n$, where $1 \leq A < 10$ and n is an integer. Use inequality notation to specify simple error intervals due to truncation or rounding. Apply and interpret limits of accuracy. **Mathematical Language:** Power Root Index Indices Standard form Inequality Truncate Round Minimum Maximum Interval Decimal place Significant figure **Notation** Standard form: $A \times 10n$, where $1 \leq A < 10$ and n is an integer Inequalities: e.g. $x > 3$, $-2 < x \leq 5$
2	Use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle). Use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line. Construct plans and elevations of 3D shapes. **Mathematical Language:** Compasses Arc Line segment Perpendicular Bisect Perpendicular bisector Locus Loci Plan Elevation
3	Understand and use the concepts and vocabulary of identities. Know the difference between an equation and an identity. Simplify and manipulate algebraic expressions by expanding products of two binomials and factorising quadratic expressions of the form $x^2 + bx + c$. Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments. Translate simple situations or procedures into algebraic expressions or formulae. **Mathematical Language:** Inequality Identity Equivalent Equation Formula Formulae Expression Expand Linear Quadratic **Notation** The equals symbol '=' and the equivalency symbol '≡'

4	Solve problems involving direct and inverse proportion including graphical and algebraic representations. Apply the concepts of congruence and similarity, including the relationships between lengths in similar figures. Change freely between compound units (e.g. density, pressure) in numerical and algebraic contexts. Use compound units such as density and pressure. **Mathematical Language:** Direct proportion Inverse proportion Multiplier Linear Congruent Congruence Similar Similarity Compound unit Density Population density Pressure **Notation** Kilograms per metre cubed is written as kg/m^3
5	Recognise and use Fibonacci type sequences, quadratic sequences. **Mathematical Language:** Term Term-to-term rule Position-to-term rule nth term Generate Linear Quadratic First (second) difference Fibonacci number Fibonacci sequence **Notation** T(n) is often used to indicate the 'nth term'
6	Understand and use the concepts and vocabulary of inequalities. Solve linear inequalities in one variable. Represent the solution set to an inequality on a number line. **Mathematical Language:** (Linear) inequality Unknown Manipulate Solve Solution set Integer **Notation** The inequality symbols: < (less than), > (greater than), ≤ (less than or equal to), ≥ (more than or equal to) The number line to represent solutions to inequalities. An open circle represents a boundary that is not included. A filled circle represents a boundary that is included. Set notation; e.g. {-2, -1, 0, 1, 2, 3, 4}
7	Identify and apply circle definitions and properties, including: tangent, arc, sector and segment. Calculate arc lengths, angles and areas of sectors of circles. Calculate surface area of right prisms (including cylinders). Calculate exactly with multiples of π. Know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$, and apply it to find lengths in right-angled triangles in two dimensional figures. **Mathematical Language:** Circle Pi Radius diameter chord circumference arc tangent sector segment (Right) prism cylinder Cross-section Hypotenuse Pythagoras' theorem **Notation** π Abbreviations of units in the metric system: km, m, cm, mm, mm^2, cm^2, m^2, km^2, mm^3, cm^3, km^3
8	Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS). Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs. **Mathematical Language:** Congruent congruence Similar (shapes) similarity Hypotenuse Conjecture Derive Prove proof Counter example **Notation** Notation for equal lengths and parallel lines SSS, SAS, ASA, RHS The 'implies that' symbol (⇒)

9	Identify and interpret gradients and intercepts of linear functions algebraically. Use the form y = mx + c to identify parallel lines. Find the equation of the line through two given points, or through one point with a given gradient. Interpret the gradient of a straight line graph as a rate of change. Recognise, sketch and interpret graphs of quadratic functions. Recognise, sketch and interpret graphs of simple cubic functions and the reciprocal function y = 1/x with x ≠ 0. plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration. **Mathematical Language:** Function equation Quadratic cubic reciprocal Gradient y-intercept x-intercept root Sketch plot Kinematic Speed distance time Acceleration deceleration Linear non-linear Parabola Asymptote Rate of change **Notation** *y = mx + c*
10	Solve, in simple cases, two linear simultaneous equations in two variables algebraically. Derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution. Find approximate solutions to simultaneous equations using a graph. **Mathematical Language:** Equation Simultaneous equation Variable Manipulate Eliminate Solve Derive Interpret
11	Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions. Enumerate sets and combinations of sets systematically, using tree diagrams. Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size. **Mathematical Language:** Outcome equally likely outcomes Event independent event dependent event Tree diagrams Theoretical probability Experimental probability Random Bias unbiased fair Relative frequency Enumerate Set **Notation** P(A) for the probability of event A Probabilities are expressed as fractions, decimals or percentage. They should not be expressed as ratios (which represent odds) or as words
12	Interpret and construct tables, charts and diagrams, including tables and line graphs for time series data and know their appropriate use. Draw estimated lines of best fit; make predictions Know correlation does not indicate causation; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing. **Mathematical Language:** Categorical data Discrete data Continuous data Grouped data Axis axes Time series Compound bar chart Scatter graph (scatter diagram, scattergram, scatter plot) Bivariate data (Linear) Correlation Positive correlation Negative correlation Line of best fit Interpolate Extrapolate Trend **Notation** Correct use of inequality symbols when labelling groups in a frequency table

Stage 10: *Unit Lists & Unit Amplification*

Unit Lists:

1. Investigating Properties of Shapes
2. Calculating
3. Solving Equations & Inequalities I
4. Mathematical Movement I
5. Algebraic Proficiency: Tinkering
6. Proportional Reasoning
7. Pattern Sniffing
8. Solving Equations & Inequalities II
9. Calculating Space
10. Conjecturing
11. Algebraic Proficiency: Visualising I
12. Exploring Fractions, Decimals & Percentages
13. Solving Equations & Inequalities III
14. Understanding Risk
15. Analysing Statistics
16. Algebraic Proficiency: Visualising II
17. Mathematical Movement II

Unit	Stage 10 Unit Amplification
1	Make links to similarity (including trigonometric ratios) and scale factors. Know the exact values of sinθ and cosθ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tanθ for θ = 0°, 30°, 45° and 60°. Know the trigonometric ratios, sinθ = opposite/hypotenuse, cosθ = adjacent/hypotenuse, tanθ = opposite/adjacent. Apply it to find angles and lengths in right-angled triangles in two dimensional figures. **Mathematical Language:** Similar Opposite Adjacent Hypotenuse Trigonometry Function Ratio Sine Cosine Tangent Angle of elevation angle of depression **Notation** sinθ stands for the 'sine of θ' $\sin^{-1}$ is the inverse sine function, and not 1÷ sin
2	Estimate powers and roots of any given positive number. Calculate with roots, and with integer and fractional indices. Calculate exactly with surds. Apply and interpret limits of accuracy, including upper and lower bounds. **Mathematical Language:** Power Root Index Indices Standard form Inequality Truncate Round Minimum bound Maximum bound Interval Decimal place Significant figure Surd Limit **Notation** Inequalities: e.g. $x > 3$, $-2 < x \leq 5$

3	Find approximate solutions to equations numerically using iteration. Solve two linear simultaneous equations in two variables algebraically. **Mathematical Language:** Unknown Solve Solution set Interval Decimal search Iteration Simultaneous equations Substitution Elimination **Notation** (a, b) for an open interval [a, b] for a closed interval
4	Identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement (including fractional scale factors). Make links between similarity and scale factors. Describe the changes and invariance achieved by combinations of rotations, reflections and translations. **Mathematical Language:** Perpendicular bisector Scale Factor Similar Congruent Invariance Transformation Rotation Reflection Translation Enlargement
5	Simplify and manipulate algebraic expressions involving algebraic fractions. Manipulate algebraic expressions by expanding products of more than two binomials. Simplify and manipulate algebraic expressions (including those involving surds) by expanding products of two binomials and factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares. Manipulate algebraic expressions by factorising quadratic expressions of the form $ax^2 + bx + c$. **Mathematical Language:** Equivalent Equation Expression Expand Linear Quadratic Algebraic Fraction Difference of two squares Binomial Factorise
6	Interpret equations that describe direct and inverse proportion. Recognise and interpret graphs that illustrate direct and inverse proportion. Understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y. **Mathematical Language:** Direct proportion Inverse proportion Multiplier **Notation** $\propto$ - 'proportional to'
7	Deduce expressions to calculate the nth term of quadratic sequences. Recognise and use simple geometric progressions (r^n where n is an integer, and r is a rational number > 0). **Mathematical Language:** Term nth term Generate Quadratic First (second) difference Geometric Progression **Notation** T(n) is often used to indicate the 'nth term'
8	Solve linear inequalities in two variables. Represent the solution set to an inequality using set notation and on a graph. **Mathematical Language:** (Linear) inequality Variable Manipulate Solve Solution set Integer Set notation Region **Notation** The inequality symbols: < (less than), > (greater than), ≤ (less than or equal to), ≥ (more than or equal to) A graph to represent solutions to inequalities in two variables. A dotted line represents a boundary that is not included. A solid line represents a boundary that is included. Set notation; e.g. {-2, -1, 0, 1, 2, 3, 4}
9	Calculate surface area and volume of spheres, pyramids, cones and composite solids. Apply the concepts of congruence and similarity, including the relationships between length, areas and volumes in similar figures. **Mathematical Language:** (Composite) solid Sphere Pyramid Cone Perpendicular (height) (slant height) Surface area Volume Congruent congruence Similarity similar shapes similar figures Enlarge enlargement Scale factor **Notation** π Abbreviations of units in the metric system: km, m, cm, mm, mm^2, cm^2, m^2, km^2, mm^3, cm^3, km^3

10	Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results. **Mathematical Language:** Radius radii Tangent Chord Theorem Conjecture Derive Prove proof Counter example **Notation** Notation for equal lengths and parallel lines The 'implies that' symbol (⇒)
11	Plot and interpret graphs (including exponential graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration. Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts. Interpret the gradient at a point on a curve as the instantaneous rate of change. Identify and interpret roots, intercepts, turning points of quadratic functions graphically. **Mathematical Language:** Function equation Linear non-linear Quadratic cubic reciprocal exponential Parabola Asymptote Gradient y-intercept x-intercept root Rate of change Sketch plot Kinematic Speed distance time Acceleration deceleration **Notation** $y = mx + c$
12	Change recurring decimals into their corresponding fractions and vice versa. Set up, solve and interpret the answers in growth and decay problems, including compound interest. **Mathematical Language:** Fraction Mixed number Top-heavy fraction Percentage change percentage increase percentage increase Compound interest Simple interest Terminating decimal Recurring decimal (Exponential) growth decay **Notation** Dot notation for recurring decimals; e.g. $0.\dot{x}y\dot{z} = 0.xyzxyzxyz\ldots$ and $0.x\dot{y} = 0.xyyy\ldots$ Note that other notations for recurring decimals are used, for example the vinculum, $0.\dot{x}y\dot{z} = 0.\overline{xyz}$ (USA); parentheses, $0.\dot{x}y\dot{z} = 0.(xyz)$ (parts of Europe); the letter 'R', $0.x^R$ (upper or lower case)
13	Solve quadratic equations algebraically by factorising. Solve quadratic equations (including those that require rearrangement) algebraically by factorising. Find approximate solutions to quadratic equations using a graph. Deduce roots of quadratic functions algebraically. **Mathematical Language:** (Quadratic) equation Factorise Rearrange Variable Unknown Manipulate Solve Deduce x-intercept Root
14	Apply systematic listing strategies including use of the product rule for counting. Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams. **Mathematical Language:** Outcome equally likely outcomes Event independent event dependent event Tree diagrams Theoretical probability experimental probability Random Bias unbiased fair Enumerate Set Conditional probability Venn diagram **Notation** P(A) for the probability of event A Probabilities are expressed as fractions, decimals or percentages. They should not be expressed as ratios (which represent odds) or as words

15	Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling. Construct and interpret diagrams for grouped discrete data and continuous data, i.e. cumulative frequency graphs, and know their appropriate use. Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data, including box plots. Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency including quartiles and inter-quartile range. **Mathematical Language:** Categorical data Discrete data Continuous data Grouped data Axis axes Population Sample Cumulative frequency Box plot box-and-whisker diagram Central tendency Mean median mode Spread dispersion consistency Range Interquartile range Skewness **Notation** Correct use of inequality symbols when labeling groups in a frequency table
16	Use the form y = mx + c to identify perpendicular lines. Recognise and use the equation of a circle with centre at the origin. Find the equation of a tangent to a circle at a given point. **Mathematical Language:** Function equation Linear non-linear Parallel Perpendicular Gradient y-intercept x-intercept root Sketch plot Centre (of a circle) Radius Tangent **Notation** $y = mx + c$
17	Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors. **Mathematical Language:** Vector Scalar Constant Magnitude **Notation** ***a*** (print) and $\underline{a}$ (written) notation for vectors $\overrightarrow{AB}$ notation for vectors Column vector notation $\begin{pmatrix} p \\ q \end{pmatrix}$, p = movement right and q = movement up

Stage 10 Light: *Unit Lists & Unit Amplification*

Unit Lists:

1. Investigating Properties of Shapes
2. Calculating
3. Solving Equations & Inequalities I
4. Mathematical Movement I
5. Algebraic Proficiency: Tinkering
6. Proportional Reasoning
7. Pattern Sniffing
8. Calculating Space
9. Exploring Fractions, Decimals & Percentages
10. Algebraic Proficiency: Visualising
11. Solving Equations & Inequalities II
12. Analysing Statistics
13. Mathematical Movement II

Unit	Stage 10 Light Unit Amplification
1	Make links to similarity (including trigonometric ratios) and scale factors. Know the exact values of sinθ and cosθ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tanθ for θ = 0°, 30°, 45° and 60°. Know the trigonometric ratios, sinθ = opposite/hypotenuse, cosθ = adjacent/hypotenuse, tanθ = opposite/adjacent. Apply it to find angles and lengths in right-angled triangles in two dimensional figures. **Mathematical Language:** Similar Opposite Adjacent Hypotenuse Trigonometry Function Ratio Sine Cosine Tangent Angle of elevation angle of depression **Notation** sinθ stands for the 'sine of θ' $\sin^{-1}$ is the inverse sine function, and not 1÷ sin
2	Calculate with roots, and with integer indices. **Mathematical Language:** Power Root Index Indices Standard form
3	Solve two linear simultaneous equations in two variables algebraically. **Mathematical Language:** Unknown Solve Simultaneous equations Substitution Elimination
4	Identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement (including fractional scale factors). Make links between similarity and scale factors. Apply the concepts of congruence and similarity, including the relationships between length in similar figures. **Mathematical Language:** Congruent congruence Similarity similar shapes similar figures Enlarge enlargement Scale factor Transformation Rotation Reflection Translation

5	Simplify and manipulate algebraic expressions by factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares. **Mathematical Language:** Equivalent Equation Expression Expand Linear Quadratic Difference of two squares Binomial Factorise
6	Interpret equations that describe direct and inverse proportion. Recognise and interpret graphs that illustrate direct and inverse proportion. Understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y. **Mathematical Language:** Direct proportion Inverse proportion Multiplier **Notation** $\propto$ - 'proportional to'
7	Recognise and use simple geometric progressions (r^n where n is an integer, and r is a rational number > 0). **Mathematical Language:** Term nth term Generate First (second) difference Geometric Progression **Notation** T(n) is often used to indicate the 'nth term'
8	Calculate surface area and volume of spheres, pyramids, cones and composite solids. **Mathematical Language:** (Composite) solid Sphere Pyramid Cone Perpendicular (height) (slant height) Surface area Volume **Notation** π Abbreviations of units in the metric system: km, m, cm, mm, mm^2, cm^2, m^2, km^2, mm^3, cm^3, km^3
9	Set up, solve and interpret the answers in growth and decay problems, including compound interest. **Mathematical Language:** Fraction Mixed number Top-heavy fraction Percentage change, percentage increase, percentage increase Compound interest Simple interest (Exponential) growth decay
10	Identify and interpret roots, intercepts, turning points of quadratic functions graphically. **Mathematical Language:** Function equation Linear non-linear Quadratic cubic reciprocal Parabola Asymptote Gradient y-intercept x-intercept root **Notation** $y = mx + c$
11	Solve quadratic equations algebraically by factorising. Find approximate solutions to quadratic equations using a graph. Deduce roots of quadratic functions algebraically. **Mathematical Language:** (Quadratic) equation Factorise Variable Unknown Manipulate Solve Deduce x-intercept Root
12	Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling. **Mathematical Language:** Categorical data Discrete data Continuous data Grouped data Axis axes Population Sample Central tendency Mean median mode Spread dispersion consistency **Notation** Correct use of inequality symbols when labeling groups in a frequency table
13	Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors. **Mathematical Language:** Vector Scalar Constant Magnitude **Notation** $\boldsymbol{a}$ (print) and $\underline{a}$ (written) notation for vectors $\overrightarrow{AB}$ notation for vectors Column vector notation $\binom{p}{q}$, p = movement right and q = movement up

Stage 11: *Unit Lists & Unit Amplification*

Unit Lists:

1. Investigating Properties of Shapes
2. Calculating
3. Solving Equations & Inequalities I
4. Mathematical Movement I
5. Algebraic Proficiency: Tinkering
6. Proportional Reasoning
7. Pattern Sniffing
8. Solving Equations & Inequalities II
9. Algebraic Proficiency: Visualising I
10. Analysing Statistics
11. Algebraic Proficiency: Visualising II
12. Mathematical Movement II

Unit	Stage 11 Unit Amplification
1	Know the formulae for Pythagoras' theorem, $a^2 + b^2 = c^2$, and apply it to find lengths in three dimensional figures. Know the trigonometric ratios, sinθ = opposite/hypotenuse, cosθ = adjacent/hypotenuse, tanθ = opposite/adjacent and apply them to find angles and lengths in three dimensional figures. Know and apply the sine rule, a/sinA = b/sinB = c/sinC, and the cosine rule, $a^2 = b^2 + c^2 - 2bc\ \cos A$, to find unknown lengths and angles. Know and apply area = ½ab sinC to calculate the area, sides or angles of any triangle. **Mathematical Language:** Diagonal (Face Diagonal, Space Diagonal) Plane Opposite Adjacent Hypotenuse Trigonometry Sine Cosine Tangent Angle of elevation angle of depression **Notation** sinθ stands for the 'sine of θ' $\sin^{-1}$ is the inverse sine function, and not 1 ÷ sin
2	Simplify surd expressions involving squares (e.g. √12 = √(4 × 3) = √4 × √3 = 2√3) and rationalise denominators. **Mathematical Language:** Power Root Index Indices Surd Simplify Rationalise **Notation** $\sqrt{a}$ represents the 'positive square root of', and the bar should be used to enclose contents correctly
3	Solve quadratic equations by completing the square and by using the quadratic formula. Deduce turning points of quadratic functions by completing the square. Deduce roots of quadratic functions algebraically. Work with general iterative processes. **Mathematical Language:** (Quadratic) equation Factorise Rearrange Complete the square Unknown Manipulate Maximum minimum Parabola Recurrence relation Interval bisection **Notation** The form $(x + p)^2 - q$ usually implies that completing the square is required Recurrence relations are equations such as $x_{n+1} = 2x_n - 3$

4	Identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement (including negative scale factors). **Mathematical Language:** Scale Factor Similar Transformation Enlargement
5	Interpret the succession of two functions as a 'composite function'. Interpret the reverse process as the 'inverse function'. **Mathematical Language:** Mapping Function Inverse function Composite function **Notation** $f(x)$ for a function of x $f^{-1}(x)$ for the inverse of a function, $f(x)$ $fg(x)$ for a function (f) of a function (g) of x
6	Construct equations that describe direct and inverse proportion. **Mathematical Language:** Direct proportion Inverse proportion Multiplier **Notation** $\propto$ - 'proportional to'
7	Recognise and use simple geometric progressions (r^n where n is an integer, and r is a rational number > 0 or a surd) and other sequences. **Mathematical Language:** Term nth term First (second) difference Geometric Progression Surd **Notation** T(n) is often used to indicate the 'nth term' r^n
8	Solve quadratic inequalities in one variable. Solve two simultaneous equations in two variables where one is quadratic algebraically. **Mathematical Language:** Unknown (Quadratic) inequality Variable Manipulate Solve Solution set Simultaneous equations Substitution Elimination **Notation** The inequality symbols: < (less than), > (greater than), ≤ (less than or equal to), ≥ (more than or equal to)
9	Recognise, sketch and interpret graphs of exponential functions y = k^x for positive values of k, and the trigonometric functions (with arguments in degrees) y = sin x, y = cos x and y = tan x for angles of any size. Sketch translations and reflections of a given function. **Mathematical Language:** Exponential Function equation Linear non-linear Quadratic cubic reciprocal exponential Parabola Asymptote Maximum minimum period Gradient y-intercept x-intercept root Sketch plot Arguments **Notation** $y = mx + c$ $f(x)$, $f(ax)$, $af(x)$, $f(x) + a$, $f(x + a)$
10	Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and know their appropriate use. **Mathematical Language:** Continuous data Grouped data Table Frequency table Frequency Frequency density Histogram Scale Graph Axis axes **Notation** Correct use of inequality symbols when labeling groups in a frequency table
11	Apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts). **Mathematical Language:** Function Complete the square Deduce Root Turning point minimum maximum Rate of change Chord Tangent Average rate of change Instantaneous rate of change **Notation** The form $(x + p)^2 - q$ usually implies that completing the square is required
12	Use vectors to construct geometric arguments and proofs. **Mathematical Language:** Vector Scalar Constant Magnitude Collinear **Notation** $\underline{\boldsymbol{a}}$ *or* $\boldsymbol{a}$ (print) and $\underline{a}$ (written) notation for vectors $\overrightarrow{AB}$ notation for vectors Column vector notation $\begin{pmatrix} p \\ q \end{pmatrix}$, p = movement right and q = movement up

Exam Preparation and Revision Timetable

(Past example)

For illustrative purposes only

This year's to be added nearer to the Christmas Holiday

Exam Preparation and Revision Timetable (Past example)

Foundation 2023-24 Exam Preparation and Revision Timetable Mathsgenie & MathsWatch - 11AB-MA3

Week	Event	MathsGenie Topic 1	MathsWatch	MathsGenie Topic 2	MathsWatch	MathsGenie Topic 3	MathsWatch	MathsGenie Topic 4	MathsWatch
18/12/2023	Revision	G3 Estimating	91	G3 Error intervals	155	G4 Prime factors, HCF and LCM	78 , 79, 80	G1 Negative Numbers	23
25/12/2023	Christmas	Mathswatch Mock Prep							
01/01/2024	Christmas	Mathswatch Mock Prep							
08/01/2024	Revision	G2 Simplifying Algebra	33 , 34, 35	G3 Substitution	95	G3 Solving Equations	135a , 135b	G4 Nth term	103
15/01/2024	Revision	G4 Inequalities	138	G4 Expanding and Factorising	93 , 134a, 94	G4 forming and solving equations	137 , 100, 135a, 135b	G4 Indices	82
22/01/2024	Revision	G3 Drawing Graphs	96	G5 Changing the Subject	136	G5 Equation of a line and G5 Gradient of a line	159a , 159b, 97	G5 Expanding and Factorising Quadratics	134b , 157
29/01/2024	Mocks	Mocks should not take up more than 4 lessons over the 2 weeks							
05/02/2024	Mocks	G5 Solving Quadratics	157 , 158	G5 Drawing Quadratic Graphs	98	G5 Solving Simultaneous Equations	162	G5 Solving Simultaneous Equations Graphically	140
12/02/2024	Revision	G3 Simplifying ratio and G3 Sharing ratio	38 , 39	G3 Fractions	25 , 70, 71, 73, 74	G3 Percentages	40 , 86, 87, 88, 89	G3 Exchange Rates	105
19/02/2024	Half term	MathsWatch Release - Paper 1 & 2 FIX it							
26/02/2024	Revision	G3 Proportion	42	G3 Percentage Change	109	G4 Compound Interest and depreciation	164	G5 Reverse Percentages	110
04/03/2024	Fix it	Mock Fix it --- Paper 1		Mock Fix it --- Paper 1		Mock Fix it --- Paper 1		Mock Fix it --- Paper 2	
11/03/2024	Fix it	Mock Fix it --- Paper 2		Mock Fix it --- Paper 2		G3 Best Buy questions	41	G2 Using a calculator	77
18/03/2024	Revision	G3 Best Buy questions	41	G2 Using a calculator	77	G2 Area and Perimeter	53 , 52	G2 Angles	13 , 45, 46a, 46b
25/03/2024	Revision	G3 Area and circumference of a circle	117 , 118	G3 Area of compound shapes	53 , 54, 55, 56	G3 Transformations	48 , 49, 50, 148	G3 Scale Drawings	38
01/04/2024	Easter	MathsWatch Release - Paper 3 FIX it							
08/04/2024	Easter	MathsWatch Release - (topics so far)							
15/04/2024	Revision	G3 Conversion and units	112	G4 Angles in Parallel Lines	120	G4 Loci and Construction	146 , 145a, 145b, 145c	G4 Angles in Polygons	123
22/04/2024	Revision	G4 Bearings	124	G4 Volumes of Prisms	119	G4 Plans and Elevations	51	G4 Cylinders	118 , 119
29/04/2024	Revision	G4 Surface Area	114a , 114b	G4 Pythagoras	150	G5 Similar Shapes	144	G5 SOHCAHTOA G5 Exact Trig	168 , 173
06/05/2024	Revision	G2 Frequency polygons	65b	G2 Pie Charts	128a	G3 Two- way tables	61	G3 Frequency trees	57
13/05/2024	Revision/Exam	G3 and G4 Probability	14 , 59, 125	G5 Probability trees	151	Exam prep		Exam day	
20/05/2024	Fix it	Mock Fix it --- Paper 3		Mock Fix it --- Paper 3		Predictive Paper		Predictive Paper	
27/05/2024	Half term	MathsWatch Release - Calc Prediction							
03/06/2024	Exam & Fix it	Exam day		Mock Fix it --- Paper 3		Predictive Paper		Predictive Paper	
10/06/2024	Exam	Exam day		All done :-)					

Number
Algebra
Ratio, Rates of change and Proportion
Geometry and Measure
Probability and Statistics

Paper 1 (non calculator) 16 May 2024 am
Paper 2 (calculator) 3rd June 2024 am
Paper 3 (calculator) 10th June 2024 am

MathsWatch

Maths Genie GCSE Revision