Maths
Key Stage 4 - Core

Curriculum document

OAK
NATIONAL
ACADEMY

1. Philosophy

Six underlying attributes at the heart of Oak's curriculum and lessons.

Knowledge and vocabulary is explicity taught across units and lessons so that pupils build on what they already know to develop powerful knowledge.

Knowledge is **sequenced** and mapped coherently so that pupils make meaningful connections

Curriculum **flexibility** enables schools to tailor their use of Oak to their curricula and context.

Addresses the needs of all learners through adherence to **accessibility** guidelines and requirements.

Rigorous application of the science of learning and best practise ensures learning is **informed by evidence**.

Commitment to **diversity** in our teaching, out teachers and in the language, texts and media we use so that all pupils feel positively represented.

2. Units

KS4 Maths is formed of 61 units and this is the recommended sequence:

Unit Title	Recommended year group	Number of lessons
1 Directed Numbers	Year 10	4
2 Rules of indices (numbers)	Year 10	4
3 Standard Form (Writing and converting)	Year 10	4
4 Standard Form 4 Operations	Year 10	4
5 Collecting, Indices, Expand and Simplify, Solving Equations 1	Year 10	16
6 Solving equations 2 (Simple algebraic fractions)	Year 10	4
7 Adding and Subtracting Fractions	Year 10	4
8 Algebraic Fractions	Year 10	4
9 Factorise and solve a quadratic (a=1)	Year 10	4

10	Substitution and Rearranging formulae	Year 10	4
11	Rotation and Enlargement	Year 10	4
12	Similarity	Year 10	4
13	Pythagoras Theorem 1	Year 10	4
14	Pythagoras Theorem 2	Year 10	4
15	Factors Multiple and Primes	Year 10	4
16	Venn Diagrams	Year 10	4
17	HCF and LCM	Year 10	4
18	Rounding and Estimating	Year 10	4
19	Simple Graphs	Year 10	4
20	Straight Line Graphs (y=mx+C)	Year 10	4
21	Straight Line Graphs 2 (Parallel Lines)	Year 10, Year 11	4

22	Simultaneous Equations (Linear)	Year 10	4
23	Scatter diagrams and Frequency trees	Year 10	4
24	Averages (From a list and tables, Stem and Leaf)	Year 10	4
25	Higher Data 1 (CF and Box Plots)	Year 10	4
26	Probability 2 (Sample space, Venn diagrams and experimental)	Year 10	4
27	Quadratic Graphs 1 (a=1)	Year 10	4
28	Quadratic Graphs 2 (a>1)	Year 10, Year 11	4
29	Ratio 1 & 2	Year 10	8
30	Percentage increase and decrease	Year 10	4
31	Repeated Percentage Change	Year 10	4
32	Fractions 1, 2, and Fractional Change	Year 10	12
33	Parts of circles 1 (Semi and quarter circles)	Year 10	4

34 Parts of circles 2 (Arcs and Sectors)	Year 10	4
35 Cylinders	Year 10	4
36 Area and Perimeter	Year 10	4
37 Trigonometry 1	Year 10	4
38 Trigonometry 2	Year 10	4
39 Trigonometry 3	Year 10	4
40 Revise - Angles, Polygons, Bearings	Year 11	12
41 Circle Theorems 1	Year 11	4
42 Circle Theorems 2	Year 11	4
43 Simplifying Surds	Year 11	4
44 Adding surds	Year 11	4
45 Functions	Year 11	4

46 Quadratic sequences	Year 11	4
47 Revise - Simultaneous Equations	Year 11	4
48 Charts and Tables (Pie Chart and Two way tables)	Year 11	4
49 Revise - Data (Mean Table, CF Charts)	Year 11	8
50 Probability 3 (Tree diagrams)	Year 11	4
51 Higher Probability (Conditional and Further Set Notation)	Year 11	4
52 Histograms	Year 11	4
53 Cubic and Reciprocal Graphs	Year 11	4
54 Travel Graphs	Year 11	4
55 Graphs of Inequalities	Year 11	4
56 Compound measures	Year 11	4
57 Volume and Surface Area 1 & 2	Year 11	8

58	Translate and Vectors 1	Year 11	4
59	Vectors 2	Year 11	4
60	Constructions	Year 11	4
61	Loci	Year 11	4

3. Lessons

Unit 1 Directed Numbers

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Adding directed numbers**	• In this lesson, we will recap adding directed (+ -) numbers using visual representations such as double sided counters to aid understanding.
2.	**Subtract directed numbers**	• In this lesson, we will recap subtracting directed (+ -) numbers using visual representations such as double sided counters to aid understanding.
3.	**Multiply and divide directed numbers**	• In this lesson, we will recap multiplying and dividing directed numbers using visual representations such as double sided counters to aid understanding.
4.	**Order of Operations**	• In this lesson, we will recap using the Order of Operations with directed numbers.

Unit 2 Rules of indices (numbers)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Multiply powers	• In this lesson we will learn how to apply and obey index laws when multiplying numbers with powers.
2.	Divide powers	• In this lesson we will learn how to apply and obey index laws when dividing numbers with powers.
3.	Powers of powers	• In this lesson we will learn how to apply index laws when raising numbers with powers to another power.
4.	Manipulating powers	• In this lesson, we will learn how to manipulate powers to change bases. We will learn how to identify when this is and is not possible.

Unit 3 Standard Form (Writing and converting)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Convert large numbers to standard form	• In this lesson, we will convert large ordinary numbers to a standard form number with positive powers of ten.
2.	Convert large standard form numbers to ordinary form	• In this lesson, we will convert standard form numbers with positive powers of ten into ordinary numbers
3.	Convert small numbers to standard form	• In this lesson, we will convert small ordinary numbers to a standard form number with negative powers of ten
4.	Convert small standard form numbers to ordinary form	• In this lesson, we will convert standard form numbers with negative powers of ten into ordinary numbers.

Unit 4 Standard Form 4 Operations

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Adding two numbers in standard form**	• In this lesson, we will learn how to add any two numbers together in standard form. We will look at initial cases where powers are equal, and move to more complicated cases where powers are different.
2.	**Subtracting two numbers in standard form**	• In this lesson, we will learn how to subtract any two numbers in standard form. We will look at initial cases where powers are equal, and move to more complicated cases where powers are different.
3.	**Multiplying Two Numbers in Standard Form**	• In this lesson, we will learn how to multiply any two numbers in standard form. We will model increasingly difficult questions and finish with a worded question involving unit conversion.
4.	**Dividing Two Numbers in Standard Form**	• In this lesson, we will learn how to divide any two numbers in standard form. We will model increasingly difficult questions and finish with a worded question.

Unit 5 Collecting, Indices, Expand and Simplify, Solving Equations 1 16 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving equations with brackets**	• In this lesson, we will solve equations with brackets including those that first need to be formed from a word problem.
2.	**Solving equations with unknown on both sides**	• In this lesson, we will solve equations with an unknown on both sides including those that first need to be formed from a word problem.
3.	**Simplify Expressions by Collecting Like Terms**	• In this lesson, we will introduce the vocabulary 'like terms' and group numbers and algebraic terms together in expressions to make them simpler.
4.	**Simplify Expressions by Multiplying Terms**	• In this lesson, we will simplify the appearance of an expression that uses multiplication of algebraic terms. We will also investigate how we can multiply two algebraic terms.

5.	**Expand a Term over a Single Bracket including Powers**	• In this lesson, we will rewrite an expression by multiplying out brackets that involve algebraic terms. We will look at cases where we are multiplying two algebraic terms together, requiring the use of indices. We will also look at generating algebraic expressions using area models.
6.	**Expand 2 brackets and simplify expressions (Part 1)**	• In this lesson, we will expand 2 brackets using algebra tiles and/or a grid e.g. where nâ‰¥1 4(nxÂ±5)+6(nxÂ±3)
7.	**Expand 2 brackets and simplify expressions (Part 2)**	• In this lesson, we will expand 2 brackets using algebra tiles and/or a grid e.g. where nâ‰¥1 4(nxÂ±5)-6(nxÂ±3)
8.	**Expand and simplify double brackets**	• In this lesson, we will expand and simplify double brackets using a grid or other method e.g. (ð‘¥+ 2)(ð‘¥ + 3)
9.	**Expand and Simplify Double Brackets (Coefficient of ð‘¥ Greater than 1)**	• In this lesson, we will expand and simplify double brackets. We will look at specific cases where the coefficient of ð‘¥ is greater than 1.
10.	**Solving one-step equations**	• In this lesson, we will solve one step equations including those that first need to be formed from a word problem.

11.	**Solving two-step equations**	• In this lesson, we will solve two step equations including those that first need to be formed from a word problem.
12.	**Expand a Term over a Single Bracket**	• In this lesson, we will rewrite an expression by multiplying out brackets that involve algebraic terms. We will also look at generating algebraic expressions using area models.
13.	**Multiplication Law for indices**	• In this lesson, we will investigate the Multiplication Law for indices. We will derive this law and use it to simplify expressions.
14.	**Division Law for indices**	• In this lesson, we will investigate the Division Law for indices. We will derive this law and use it to simplify expressions.
15.	**Power Law for Indices**	• In this lesson, we will investigate the Power Law for indices. We will derive this law and use it to simplify expressions.
16.	**Combining Index Laws**	• In this lesson, we will be applying all three Index Laws to help us simplify more complicated expressions.

Unit 6 Solving equations 2 (Simple algebraic fractions) — 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving algebraic fractions (one fraction equal to another)**	• In this lesson, we will be solving algebraic fractions where one fraction is equal to another fraction.
2.	**Solve simple algebraic fractions (equal to a number)**	• In this lesson, we will solve equations with algebraic fractions equal to a number.
3.	**Solve equations that first involve simplification 2 (x + 3) + 5x = 15**	• In this lesson, we will solve equations that first need some type of simplification.
4.	**Solving algebraic fractions (equal to x + a)**	• In this lesson, we will solve equations with an algebraic fraction equal to a number and an unknown value.

Unit 7 Adding and Subtracting Fractions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Adding and subtracting fractions < 1	• In this lesson, we will learn how to add and subtract proper fractions with different denominators.
2.	Adding mixed numbers	• In this lesson, we will learn how to add mixed numbers to other mixed numbers or fractions with different denominators
3.	Subtracting mixed numbers	• In this lesson, we will learn how to subtract mixed numbers from other mixed numbers or fractions with different denominators
4.	Mixed fraction addition and subtraction problems	• In this lesson, we will learn how to add and/or subtract fractions and/or mixed numbers in problems presented in a non-standard form

Unit 8 Algebraic Fractions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Add two algebraic fractions with integer denominators**	• In this lesson, we will learn how to add two algebraic fractions together that have integer denominators by finding common denominators.
2.	**Subtract two algebraic fractions with an integer denominator**	• In this lesson, we will learn how to subtract two algebraic fractions together that have integer denominators by finding common denominators.
3.	**Solving equations involving adding two fractions**	• In this lesson, we will learn how to add two algebraic fractions together. We will look at cases that share a common denominator, have different denominators, and perimeter contextual questions.
4.	**Solving equations involving subtracting two fractions**	• In this lesson, we will learn how to subtract two algebraic fractions together. We will look at cases that share a common denominator, have different denominators..

Unit 9 Factorise and solve a quadratic (a=1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Factorise a quadratic	• In this lesson, we will learn how to factorise a quadratic expression into two brackets
2.	Factorise a quadratic (difference of two squares)	• In this lesson, we will learn how to factorise a quadratic expression as a difference of two squares
3.	Solve a quadratic equation by factorising	• In this lesson, we will learn how to solve a quadratic equation by factorising the expression to determine what values produce a zero multiplier.
4.	Simplifying an algebraic fraction by factorising	• In this lesson, we will learn how to simplify algebraic fractions by factorising and identifying common factors in both the numerator and denominator.

Unit 10 Substitution and Rearranging formulae

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Change the subject of a formula**	• In this lesson, we will change the subject of a formula in which the term appears once.
2.	**Change the subject of a formula with squares and square roots**	• In this lesson, we will change the subject of a formula where the formula involves squares and square roots and the term only appears once.
3.	**Substitute a positive term into a formula**	• In this lesson, we will be substituting positive values into a variety of formulae and calculating the result.
4.	**Substitute a negative term into a formula**	• In this lesson, we will be substituting negative values into a variety of formulae, and calculating the result.

Unit 11 Rotation and Enlargement

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Rotate an Object around a Given Point**	• In this lesson, we will rotate any object around a given centre of rotation.
2.	**Rotate an Object around a Given Coordinate**	• In this lesson, we will rotate any object around a given centre of rotation, and describe rotations on coordinate grids.
3.	**Enlarge an Object with a Positive Scale Factor**	• In this lesson, we will enlarge objects by a given scale factor, and identify scale factors.
4.	**Enlarge an Object with a Positive Scale Factor from a Given Coordinate**	• In this lesson, we will enlarge objects by a given scale factor, and describe enlargements on coordinate grids.

Unit 12 Similarity

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find missing lengths in similar separate shapes**	• In this lesson, we will use scale factors to find missing side lengths in similar shapes. We will practise using our knowledge of proportion to calculate missing lengths.
2.	**Identify similar shapes and show shapes are similar**	• In this lesson, we will learn the conditions for shapes to be similar and identify similar shapes. We will learn how to identify the properties of a similar shape to help us determine when a shape is, or is not, similar to another.
3.	**Find missing lengths in similar shapes which have sides overlapping**	• In this lesson, we will find missing side lengths for similar shapes which have side lengths overlapping
4.	**Identify congruent shapes**	• In this lesson, we will learn about the conditions for congruent shapes and identify congruent shapes.

Unit 13 Pythagoras Theorem 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Know and Understand Pythagoras' theorem	• In this lesson, Pythagoras' Theorem will be introduced. We will learn what the theorem is, and practise skills we will use to calculate missing sides such as squaring and finding the square root of a number.
2.	Find the length of the shorter side	• In this lesson, Pythagoras' Theorem will be applied to find a shorter side of a right-angled triangle.
3.	Mixture of Finding a Missing Length	• In this lesson, we will apply Pythagoras' Theorem to find any missing length of a right-angled triangle.
4.	Find the length of the hypotenuse	• In this lesson, Pythagoras' Theorem will be applied to find the hypotenuse of a right-angled triangle.

Unit 14 Pythagoras Theorem 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use Pythagoras' theorem to show that a triangle is right-angled**	• In this lesson, we will apply Pythagoras' Theorem to determine if a triangle is right-angled. This is known as the converse of Pythagoras' Theorem.
2.	**Use Pythagoras' Theorem to find the length of a line segment**	• In this lesson, we will use Pythagoras' Theorem to find the length of a line segment that joins two pairs of coordinates
3.	**Use Pythagoras' Theorem with Isosceles Triangles**	• In this lesson, we will learn how to apply Pythagoras' Theorem to isosceles triangles to find missing side lengths or angles.
4.	**Apply Pythagoras' Theorem to two triangles**	• In this lesson, we will apply Pythagoras' Theorem to two triangles that share a common side.

Unit 15 Factors Multiple and Primes

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Identify Prime Numbers	• In this lesson, we will recap identifying prime numbers. We will define prime numbers and explain their properties.
2.	Using Prime Factor Decomposition	• In this lesson, we will investigate how we can manipulate numbers when they are written as a product of their prime factors. We will learn how to idenitfy various properties of numbers by interrogating them as a product of prime factors.
3.	Multiples and Factor Pairs	• In this lesson, we will recap the fundamental concepts of multiples and factors of a single number. We will explore the concepts using bar models and dot arrays.
4.	Prime Factor Decomposition	• In this lesson, we will revisit the concept of using factor trees to rewrite a number as a product of its prime factors.

Unit 16 Venn Diagrams

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Understand Venn diagrams, sort data and label**	• In this lesson, we will learn about the universal set and members of a set. We will interpret different representations (2 circles only) of a Venn diagram for given listed information, including sorting and labelling data
2.	**Find and understand the intersection of 2 sets**	• In this lesson, we will learn how to find the intersection of two sets of data and use the correct set notation (2 circles only). We will learn how to sort information into a Venn diagram, where calculations are involved.
3.	**Complement of a set**	• In this lesson, we will learn what the complement of a set is and use the correct set notation. We will practise finding the compliment of a set.
4.	**Find and understand the union of 2 sets**	• In this lesson, we will learn how to find the union of two sets and use the correct set notation, recapping intersection and looking at Venn diagrams with more than 2 circles

Unit 17 HCF and LCM

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Simple LCM and HCF	• In this lesson, we will learn about the terms 'Lowest Common Multiple' and 'Highest Common Factor'. We will learn how to determine lowest common multiples for small integers by listing and comparing their factors and multiples.
2.	Finding the LCM	• In this lesson, we will find the 'Lowest Common Multiple' of two integers using a Venn diagram to compare their prime factors.
3.	Finding the HCF	• In this lesson, we will find the 'Highest Common Factor' of two integers by comparing their prime factors using a Venn diagram.
4.	Applying LCM and HCF	• In this lesson, we will answer problem solving questions involving determining the lowest common multiple and highest common factor of two integers. We will model solutions to a range of problems including worded questions.

Unit 18 Rounding and Estimating

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Round to two decimal places**	• In this lesson, we will learn how to round numbers to two decimal places using place value and number lines.
2.	**Round up to three significant figures**	• In this lesson, we will learn how to round numbers to 1, 2 or 3 significant figures
3.	**Limits of accuracy**	• In this lesson, we will learn how to find the upper and lower bounds of a rounded value and use this information in simple calculations
4.	**Estimating answers**	• In this lesson, we will learn how to estimate the answer to a calculation by rounding all the values to one significant figure before calculating.

Unit 19 Simple Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw and recognise graphs of the form y = kx**	• In this lesson, we will be drawing graphs in the form y=kx. We will identify features of these graphs and learn how to identify these graphs from their visual properties.
2.	**Draw graphs of the form y=mx+c by using a table of values**	• In this lesson, we will be drawing graphs in the form y=mx+c. We will use the equation of the line to determine a set of coordinates using a table of values, which we will then plot.
3.	**Draw graphs of the form ax+by = c by using a table of values**	• In this lesson, we will be drawing graphs in the form ax+by=c through drawing a table of values. We will investigate how we can use our knowledge of number bonds and inspection to help us calculate a table of values more easily.
4.	**Use graphs to solve simple equations including simultaneous equations**	• In this lesson, we will investigate how to solve a pair of simultaneous equations by ploptting them and interpreting the coordinates at the point of intersection.

Unit 20 Straight Line Graphs (y=mx+C) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the gradient of a line**	• In this lesson, we will revise the term 'gradient' and learn how to identify and calculate the gradient of a plotted line using two pairs of coordinates. We will compare lines with different gradients.
2.	**Find the equation of a straight line using y=mx+c**	• In this lesson, we will find the equation of a straight line using y=mx+c. We will use coordinates taken from a plotted straight line to help us calculate the gradient, then use a method of substitution to find the equation of the line.
3.	**Using gradient to solve problems with parallel lines**	• In this lesson, we will use the gradient of a line to solve problems with parallel lines. We will investigate the relationship between different linear graphs with the same gradient.
4.	**Find the intercept and gradient from a line given in any form**	• In this lesson, we will investigate different strategies to find the intercept and gradient for a linear graph. Each method will utilise the equation of the line.

Unit 21 Straight Line Graphs 2 (Parallel Lines) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Interpret gradient and intercept on real life graphs**	• In this lesson, we will calculate and interpret the gradient and intercepts on real life graphs. We will draw upon our skills of drawing triangles to calculate gradients.
2.	**Write the equation of a straight line if parallel to a line and passing through any point**	• In this lesson, we will investigate how to calculate the equation of a straight line that is parallel to an existing line, and passes through a known coordinate.
3.	**Find the equation of a straight line through two given points**	• In this lesson, we will investigate how to calculate the equation of a line, given two pairs of coordinates that the line passes through.
4.	**Write the equation of a straight line if parallel to a line and passing through (0,n)**	• In this lesson, we will investigate how to calculate the equation of a straight line that is parallel to an existing line, and passes through a known point on the y-axis.

Unit 22 Simultaneous Equations (Linear) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solve linear simultaneous equations where one of the coefficients is equal**	• In this lesson, we will introduce solving simultaneous equations pictorially, then solve algebraically using subtraction and addition. We will look at cases where the coefficients of either x or y are equal.
2.	**Solve linear simultaneous equations where you need to multiply one of the equations**	• In this lesson, we will solve simultaneous equations using the visual representation of a bar model to help us derive values for unknowns in linear equations.
3.	**Solve linear simultaneous equations where you need to multiply both equations**	• In this lesson, we will investigate how to solve simultaneous equation cases where the coefficient of one term is not a multiple or factor of the other. We will use multiplication to find new equations and create common coefficients.
4.	**Solve linear simultaneous equations where you need to first rearrange**	• In this lesson, we will investigate how to solve simultaneous equation cases where we need to rearrange equations first, followed by using multiplication to ensure coefficients in one equation are factors or multiples of the other.

Unit 23 Scatter diagrams and Frequency trees

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use a line of best fit on a scatter graph**	• In this lesson, we will learn how to draw and interpret a line of best fit on a scatter graph
2.	**Draw and interpret a frequency tree**	• In this lesson, we will learn how to draw and interpret a frequency tree diagram.
3.	**Plot a scatter graph and describe correlation**	• In this lesson, we will learn how to plot a scatter graph. We will also learn about different types of correlation in scatter graphs, and be able to correctly identify correlation patterns in scatter graphs.
4.	**Identify and explain outliers from a scatter diagram**	• In this lesson, we will learn to identify and explain outliers from a scatter diagram

Unit 24 Averages (From a list and tables, Stem and Leaf) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Mean from a frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a frequency table.
2.	**Mean from a grouped frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a grouped frequency table.
3.	**Find the mean, median, mode and range from a list of numbers**	• In this lesson, we will learn how to calculate the mean, median, mode and range from a list of numbers
4.	**Stem and leaf diagrams**	• In this lesson, we will learn how to draw and interpret stem and leaf diagrams.

Unit 25 Higher Data 1 (CF and Box Plots)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Plot a cumulative frequency diagram	• In this lesson, we will learn how to plot a cumulative frequency diagram. We will learn how to interpret and solve questions around cumulative frequency diagrams
2.	Find quartiles and interquartile range from CF diagram	• In this lesson, we will calculate the median, upper and lower quartiles and the interquartile range from a cumulative frequency diagram
3.	Find quartiles from a list of data	• In this lesson, we will calculate the median, upper and lower quartiles and the interquartile range for a data set.
4.	Plot a box plot and compare distributions	• In this lesson, we will construct box plots and read data from them including comparing data from two or more distributions

Unit 26 Probability 2 (Sample space, Venn diagrams and experimental)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**List outcomes in a sample space diagram (two-way table) and calculate probabilities**	• In this lesson, we will learn how to construct and interpret sample space diagrams (two-way tables) including calculating probabilities, for a variety of contexts.
2.	**Calculate experimental probabilities and make predictions (relative frequency)**	• In this lesson, we will learn how to record data in a relative frequency table and use the probabilities to make predictions, including scenarios such as spinners or rolling dice.
3.	**Find probabilities from Venn diagrams including basic set notation**	• In this lesson, we will learn how to calculate probabilities from Venn diagrams with 2 or more sets, including using the correct notation for union, intersect and complement. It is useful to have a knowledge of how to draw Venn diagrams prior to this lesson but this skill is revised.

4.

Find probabilities from frequency trees

- In this lesson, we will learn how to use frequency trees to find probabilities including revision on how to draw frequency trees given some information.

Unit 27 Quadratic Graphs 1 (a=1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Plot simple quadratic equations**	• In this lesson, we will plot graphs of simple quadratic equations and recognise some of their properties. We will determine the general features of quadratic graphs.
2.	**Solving Quadratic Equations Graphically**	• In this lesson, we will interpret graphs of quadratic equations in order to find their solutions. We will investigate the key features of quadratic graphs that help us identify their solutions.
3.	**Identify and interpret roots, intercepts and turning points of quadratic graphs**	• In this lesson, we will recognise the roots, y-intercept and turning points on a graph of a quadratic function. We will define these key terms and investigate quadratic curves to help label them with this new vocabulary.
4.	**Plot other quadratic equations**	• In this lesson, we will plot graphs of quadratic equations of the form axÂ² + bx + c and recognise some of their properties. We will investgate how different coefficients alter the appearance of the quadratic curve.

Unit 28 Quadratic Graphs 2 (a>1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving quadratic equations, given a different quadratic, using a sketch**	• In this lesson, we will learn how to solve quadratic equations, given a different quadratic, using a sketch.
2.	**Draw quadratic graphs (a > 1)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of xÂ² is greater than 1
3.	**Draw quadratic graphs (negative x squared)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of xÂ² is negative.
4.	**Solve quadratic graphs = 0, = a and = ax + b**	• In this lessons we will learn how to use graphs to find solutions to equations where one is quadratic and one is linear.

Unit 29 Ratio 1 & 2

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Divide a quantity in a given ratio**	• In this lesson, we will learn how to use and interpret bar models to divide a quantity in a given ratio and solve problems.
2.	**Simplifying ratios**	• In this lesson, we will learn how to simplify up to three part ratios, including those with different units of measure.
3.	**Find a part given a part**	• In this lesson, we will learn how to find a part of a ratio when given another part using bar models and solve similar problems in context
4.	**Find the total or difference given a part**	• In this lesson, we will learn how to find the total or difference between numbers in a given ratio, when provided with one part of that ratio. We will model solutions using part-part-whole bar models and solve problems in context.

5.	**Ratio and fractions**	• In this lesson, we will learn how to write ratios as fractions. We will investigate the similarities and differences between both formats.
6.	**Compare the cost of two items using the unitary method**	• In this lesson, we will compare the cost of two items using the unitary method. We will learn how to reduce ratios to 1:n using a double number line.
7.	**Using direct proportion graphs**	• In this lesson, we will learn how to use, interpret, and answer questions from interrogating direct proportion graphs.
8.	**Proportion problems**	• In this lesson, we will practise using ratio to solve proportion problems. We will model problems and their solutions in worded problems.

Unit 30 Percentage increase and decrease

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Calculate Percentage Change**	• In this lesson, we will learn about how to determine the proportional percentage increase or decrease between two values
2.	**Increase and Decrease an Amount by a Percentage**	• In this lesson, we will learn about increasing or decreasing an amount by a percentage determining and using a decimal multiplier.
3.	**Reverse Percentages**	• In this lesson, we will learn how to calculate reverse percentages. We will learn how to take a given quantity as a percentage of a whole, and use it to calculate the value of the whole.
4.	**Simple Interest**	• In this lesson, we will learn about calculating simple interest. We will investigate what the term means, and learn how to calculate it and solve problems.

Unit 31 Repeated Percentage Change

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Repeated percentage decrease	• In this lesson, we will learn how to apply a repeated percentage decrease by using multipliers
2.	Repeated percentage increase	• In this lesson, we will learn how to apply a repeated percentage increase by using multipliers.
3.	Solve problems with repeated percentage change	• In this lesson, we will learn how to calculate how many repeated percentage increases or decreases are needed to reach a given amount
4.	Repeated percentage increase and decrease	• In this lesson, we will learn how to apply a repeated percentage increase and decrease by using multipliers

Unit 32 Fractions 1, 2, and Fractional Change

12 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Fraction of an amount**	• In this lesson, we will investigate methods to find a fraction of an amount without using a calculator.
2.	**Increasing and decreasing by a fraction of an amount**	• In this lesson, we will find a fraction of an amount. We will use this information to increase or decrease the original quantity by this amount.
3.	**Find the whole when given a fraction of an amount**	• In this lesson, we will learn that given the fraction of an amount, we can find what the original quantity was. We will investigate ways to do this.
4.	**Application of fraction of an amount skills**	• In this lesson, we will investigate a mixture of problems involving finding the fraction of an amount.
5.	**Adding and subtracting fractions < 1**	• In this lesson, we will learn how to add and subtract proper fractions with different denominators.

6.	**Adding mixed numbers**	• In this lesson, we will learn how to add mixed numbers to other mixed numbers or fractions with different denominators
7.	**Subtracting mixed numbers**	• In this lesson, we will learn how to subtract mixed numbers from other mixed numbers or fractions with different denominators
8.	**Mixed fraction addition and subtraction problems**	• In this lesson, we will learn how to add and/or subtract fractions and/or mixed numbers in problems presented in a non-standard form
9.	**Multiplying a fraction by an integer**	• In this lesson, we will multiply a fraction by an integer, including mixed numbers and negative values.
10.	**Multiplying a fraction by a fraction**	• In this lesson, we will multiply a fraction by a fraction, including mixed numbers and negative values.
11.	**Dividing a fraction by an integer**	• In this lesson, we will divide a fraction by an integer, including mixed numbers and negative values.

12. **Dividing a fraction by a fraction**

- In this lesson, we will divide a fraction by a fraction, including mixed numbers and negative values.

Unit 33 Parts of circles 1 (Semi and quarter circles)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Know the parts of a circle**	• In this lesson, we will identify parts of a circle by their mathematical names
2.	**Find the area of a semicircle and quarter circle**	• In this lesson, we will find the area of a semicircle and quarter circle in terms of pi or to 3 significant figures
3.	**Find the area of a sector**	• In this lesson, we will find the area of sectors in terms of pi or to 3 significant figures
4.	**Find the radius or diameter given the area of a sector**	• In this lesson, we will find the radius or diameter given the area of a sector

Unit 34 Parts of circles 2 (Arcs and Sectors)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the length of an arc on a semicircle and quarter circle and the perimeter of a semicircle and quarter circle**	• In this lesson, we will find the length of an arc on a semicircle and quarter circle and the perimeter of a semicircle and quarter circle
2.	**Find the length of an arc and the perimeter of a sector**	• In this lesson, we will find the length of an arc and the perimeter of a semicircle
3.	**Use the arc length to find the radius or angle of a sector**	• In this lesson, we will use the arc length to find the radius or angle of the sector
4.	**Calculate area of compound shapes with circles**	• In this lesson, we will calculate the area of compound shapes that include circles or parts of circles.

Unit 35 Cylinders

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the volume of a cylinder**	• In this lesson, we will find the volume of a cylinder in terms of pi or to 3 significant figures. We will learn the formula for finding the volume of a cylinder and practise using it when given either the radius or diameter of a cylinder and its height.
2.	**Volume of a cylinder problems**	• In this lesson, we will use our knowledge of cylinders and the formula for their volume to solve a variety of cylinder problems.
3.	**Surface area of a cylinder**	• In this lesson, we will calculate the surface area of a cylinder to 3 significant figures. We will learn the appropriate formula for this calculation and practise finding the surface area when provided with the radius or diameter, and the length of the cylinder.
4.	**Surface area problems**	• In this lesson, we will use our knowledge of the surface area of a cylinder to solve a variety of worded and diagram-based problems.

Unit 36 Area and Perimeter

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Area of rectangles, parallelograms and triangles**	• In this lesson, we will practise using the formulae to calculate the area of rectangles, parallelograms and triangles. We will model how to determine which measures within a diagram are appropriate to use for the formulae.
2.	**Area of a trapezium**	• In this lesson, we will practise applying the formula to calculate the area of a trapezium. We will consider examples that use different trapezia in different orientations to help us determine what measures are suitable to use in our formula.
3.	**Area of compound shapes**	• In this lesson, students will find the area of compound shapes by dividing the shape up into simpler more easily recognisable shapes and finding the sum of their parts.

4. **Perimeter of polygons and compound shapes**

- In this lesson, students will find the perimeter of polygons and compound shapes by dividing the shape up into simpler more easily recognisable shapes and finding the sum of their perimeters.

Unit 37 Trigonometry 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Know tangent, sine and cosine	• In this lesson, we will learn how to correctly label a right-angled triangle, and identify the correct trigonometric ratio to use.
2.	Applying Trigonometry	• In this lesson, we will apply and manipulate the full compliment of trigonometric ratios to solve missing length triangle problems.
3.	Use sine and cosine to find a length	• In this lesson, we will calculate missing lengths using sine and cosine trigonometric ratios.
4.	Use tangent to find a length	• In this lesson, we will calculate missing lengths using the tangent trigonometric ratio.

Unit 38 Trigonometry 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use trigonometry to find the perpendicular height of a triangle**	• In this lesson, we will identify the perpendicular height of triangles, use trigonometry to find the perpendicular height and apply this to find the area of a triangle.
2.	**Solve basic trigonometry equations**	• In this lesson, we will use a calculator to work out values of angles by rearranging trigonometric equations relating to sides and angles and using inverse trigonometric functions.
3.	**Use inverse functions to find an angle**	• In this lesson, we will find a missing angle in a given triangle using the inverse trigonometric functions. We will need to interpret which trigonometric ratio to use, and rearrange it.
4.	**Solve problems mixing angles and sides**	• In this lesson, we will apply trigonometry to multi-step problems by finding missing sides and missing angles

Unit 39 Trigonometry 3

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Know when to use Pythagoras or Trigonometry to solve problems**	• In this lesson, we will recognise when it is appropriate to use Pythagoras or Trigonometry when finding missing lengths and angles in right angle triangles.
2.	**Use trigonometry to solve bearing problems**	• In this lesson, we will apply prior knowledge of bearings and trigonometry to solve problems.
3.	**Substitute the exact values to find a missing length**	• In this lesson, we will find a missing length of a right angled triangle using prior knowledge of exact trigonometry ratios for 0Â°, 30Â°,45Â°,60Â° and 90Â°
4.	**Know the trigonometry ratios for 0Â°, 30Â°, 45Â°, 60Â° and 90Â°**	• In this lesson, we will use an equilateral triangle and an isosceles triangle to work out the exact values for trigonometry ratios for 0Â°, 30Â°,45Â°,60Â° and 90Â°

Unit 40 Revise - Angles, Polygons, Bearings

12 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find missing angles in a quadrilateral**	• In this lesson, we will calculate the missing angles in a quadrilateral. We will revisit the properties of angles in a quadrilateral to help us deduce the value of missing angles in problems.
2.	**Find missing angles in a special quadrilateral**	• In this lesson, we will calculate the missing angles in a trapezium, parallelogram and a kite. We will revisit the properties of these quadrilaterals in order to help us deduce the value of missing angles in diagrams.
3.	**Find missing exterior angles of polygons**	• In this lesson, we will calculate missing exterior angles of any regular or irregular polygon.
4.	**Finding the sum of interior angles in a polygon**	• In this lesson, we will calculate the sum of interior angles in polygons, and apply this to find missing angles.
5.	**Find the number of sides when given the sum of interior angles**	• In this lesson, we will find the number of sides of a polygon when given only the sum of interior angles.

6.	**Find missing angles when two or more polygons are joined**	• In this lesson, we will apply regular polygon knowledge to find missing angles when two or more polygons are joined together.
7.	**Find missing angles around a point and on a straight line**	• In this lesson, we will calculate the missing angles around a point and on a straight line. We will revisit the properties of angles on a straight line and a point, and use this information to help us deduce the value of missing angles in problems.
8.	**Find missing angles in a triangle**	• In this lesson, we will calculate the missing angles in a triangle. We will revisit the properties of angles in a triangle and angles on a straight line to help us deduce the value of missing angles in problems.
9.	**Angles in parallel lines with one transversal**	• In this lesson, we will find missing angles in parallel lines with one transversal
10.	**Angles in parallel lines with two transversals**	• In this lesson, we will find missing angles in parallel lines with two transversals
11.	**Find missing exterior angles**	• In this lesson, we will calculate the size of a missing exterior angle on a regular and irregular polygon

12. **Solve problems involving exterior angles**

- In this lesson, we will calculate the number of sides a regular polygon has when given an exterior or interior angle

Unit 41 Circle Theorems 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Circle Theorems: Angles in a cyclic quadrilateral**	• In this lesson, we will learn that opposite angles in a cyclic quadrilateral sum to 180 degrees. We will prove this result with a general case.
2.	**Circle Theorems: Angles in the same segment**	• In this lesson, we will learn that angles in the same segment are equal when subtended from the same chord. We will prove this result with a general case.
3.	**Circle Theorems: Angle in a semicircle is 90 degrees**	• In this lesson, we will learn that the angle in a semicircle is 90 degrees when the angle is subtended from the diameter. We will prove this result with a general case.
4.	**Circle Theorems: Angle at the centre and angle at the circumference**	• In this lesson, we will learn that the angle at the centre of a circle is twice the angle at the circumference when subtended from the same arc. We will prove this result with a general case.

Unit 42 Circle Theorems 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Mixed circle theorem problems**	• In this lesson, we will practise answering different circle theorem problems that will require us to recall knowledge from each of the circle theorems.
2.	**Circle Theorems: The perpendicular from the centre to a chord bisects the chord**	• In this lesson, we will learn that a perpendicular from the centre to a chord bisects the chord. We will prove this result with a general case.
3.	**Circle Theorems: The alternate segment theorem**	• In this lesson, we will learn that an angle made with a chord and tangent is equal to the angle subtended by the chord in the alternate segment. We will prove this result with a general case.
4.	**Circle Theorems: A tangent and radius are perpendicular at the point of contact**	• In this lesson, we will learn that a tangent and radius are perpendicular at the point of contact. We will prove this result with a general case.

Unit 43 Simplifying Surds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Identify rational and irrational numbers**	• In this lesson, we will learn the definitions of rational and irrational numbers and how to identify and interpret them.
2.	**Simplify simple surds**	• In this lesson, we will simplify surds of the form âˆšb. We will use our knowledge of factors and square roots to reduce surds to their simplest form.
3.	**Simplify a surd of the form aâˆšb**	• In this lesson, we will simplify surds of the form aâˆšb. We will use our knowledge of factors and square roots to reduce surds to their simplest form.
4.	**Write aâˆšb in form âˆšx**	• In this lesson, we will write surds of the form aâˆšb in the form âˆšx. We will use our knowledge of factors and square roots to reduce surds to their simplest form.

Unit 44 Adding surds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Subtract two surds**	• In this lesson, we will learn how to subtract one surd from another where no prior simplification is needed.In these cases, the surds will all have the same root.
2.	**Add two surds**	• In this lesson, we will learn how to add two or more surds where no prior simplification is needed.In these cases, the surds will all have the same root.
3.	**Add two surds where you need to simplify**	• In this lesson, we will learn how to add two surds where you may need to simplify at least one surd prior to adding.
4.	**Subtract two surds where you need to simplify**	• In this lesson, we will learn how to subtract two surds where you may need to simplify at least one surd prior to subtracting.

Unit 45 Functions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find a particular value of f(x)**	• In this lesson, we will use substitution skills and knowledge of order of operations to find a particular value of f(x)
2.	**Solve equations using f(x) =**	• In this lesson, we will use knowledge of using inverse functions to solve equations using f(x)
3.	**Composite functions**	• In this lesson, we will apply more than one function to a number or a variable using substitution, knowledge of expanding brackets and also apply these skills to solving equations such as fg(x) = h(x)
4.	**Find inverse functions**	• In this lesson, we will use knowledge of using inverse functions (function machines) and making x the subject to find inverse functions.

Unit 46 Quadratic sequences

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the nth term of a quadratic sequence**	• In this lesson, we will find the nth term of a quadratic sequence by using a table of values and finding the second difference between terms.
2.	**Solve quadratic inequalities (a = 1)**	• In this lesson, we will solve quadratic inequalities with an xÂ^2 coefficient of 1 and express solutions using set notation.
3.	**Solve simple quadratic inequalities**	• In this lesson, we will solve simple quadratic inequalities and express solutions using set notation.
4.	**Solve quadratic inequalities (a > 1)**	• In this lesson, we will solve quadratic inequalities with an xÂ^2 coefficient greater than 1 and express solutions using set notation.

Unit 47 Revise - Simultaneous Equations

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solve linear simultaneous equations where one of the coefficients is equal**	• In this lesson, we will introduce solving simultaneous equations pictorially, then solve algebraically using subtraction and addition. We will look at cases where the coefficients of either x or y are equal.
2.	**Solve linear simultaneous equations where you need to multiply one of the equations**	• In this lesson, we will solve simultaneous equations using the visual representation of a bar model to help us derive values for unknowns in linear equations.
3.	**Solve linear simultaneous equations where you need to multiply both equations**	• In this lesson, we will investigate how to solve simultaneous equation cases where the coefficient of one term is not a multiple or factor of the other. We will use multiplication to find new equations and create common coefficients.
4.	**Solve linear simultaneous equations where you need to first rearrange**	• In this lesson, we will investigate how to solve simultaneous equation cases where we need to rearrange equations first, followed by using multiplication to ensure coefficients in one equation are factors or multiples of the other.

Unit 48 Charts and Tables (Pie Chart and Two way tables) — 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Interpret timetables and distance tables**	• In this lesson, we will learn how to interpret timetables and distance tables
2.	**Design and interpret two-way tables**	• In this lesson, we will learn how to design and interpret two-way tables. We will model how to solve problems involving two-way tables.
3.	**Plot and interpret time-series graphs**	• In this lesson, we will learn how to plot and interpret time-series graphs. We will model how to solve problems using these graphs.
4.	**Draw and interpret pie charts**	• In this lesson, we will learn how to draw and interpret pie charts from frequency tables. We will learn how to calculate angles that represent each proportion of data.

Unit 49 Revise - Data (Mean Table, CF Charts)

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Plot a cumulative frequency diagram**	• In this lesson, we will learn how to plot a cumulative frequency diagram. We will learn how to interpret and solve questions around cumulative frequency diagrams
2.	**Find quartiles and interquartile range from CF diagram**	• In this lesson, we will calculate the median, upper and lower quartiles and the interquartile range from a cumulative frequency diagram
3.	**Find quartiles from a list of data**	• In this lesson, we will calculate the median, upper and lower quartiles and the interquartile range for a data set.
4.	**Plot a box plot and compare distributions**	• In this lesson, we will construct box plots and read data from them including comparing data from two or more distributions
5.	**Mean from a frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a frequency table.

6.	**Mean from a grouped frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a grouped frequency table.
7.	**Find the mean, median, mode and range from a list of numbers**	• In this lesson, we will learn how to calculate the mean, median, mode and range from a list of numbers
8.	**Stem and leaf diagrams**	• In this lesson, we will learn how to draw and interpret stem and leaf diagrams.

Unit 50 Probability 3 (Tree diagrams)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw a tree diagram for independent events**	• In this lesson, we will learn how to draw tree diagrams and complete missing probabilities in tree diagrams for independent events.
2.	**Calculate probabilities of independent events**	• In this lesson, we will learn how to calculate probabilities of outcomes for independent events from tree diagrams
3.	**Draw a tree diagram for dependent events**	• In this lesson, we will learn how to draw tree diagrams and complete missing probabilities in tree diagrams for dependent events.
4.	**Calculate probabilities of dependent events**	• In this lesson, we will learn how to calculate probabilities of outcomes for dependent events from tree diagrams

Unit 51 Higher Probability (Conditional and Further Set Notation) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Conditional probability word problems**	• In this lesson, we will learn how to tackle conditional probability word problems. Prior knowledge of how to draw tree diagrams is essential to this lesson.
2.	**Conditional probability from a two-way table**	• In this lesson, we will interpret two-way tables and find conditional probabilities from them.
3.	**Probability from a venn diagram using further set notation (2 sets)**	• In this lesson, we will interpret Venn diagrams with two sets and find probabilities, including conditional probabilities from them, using the correct set notation.
4.	**Probability from a venn diagram using further set notation (3 sets)**	• In this lesson, we will interpret Venn diagrams with three sets and find probabilities, including conditional probabilities from them, using the correct set notation.

Unit 52 Histograms

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the median from a histogram**	• In this lesson, we will learn how to use a histogram to estimate the median, quartiles or frequencies using parts of bars
2.	**Find probabilities from a histogram**	• In this lesson, we will learn how to find probabilities from a histogram by finding the frequencies represented by each bar and the vertical scale.
3.	**Plot a histogram**	• In this lesson, we will learn how to find frequency density for grouped frequency distributions with unequal class intervals and use them to plot a histogram
4.	**Find frequency from a histogram**	• In this lesson, we will learn how to complete a frequency table from a histogram, use a histogram and a known frequency to find the scale on the vertical axis and subsequently all the other frequencies.

Unit 53 Cubic and Reciprocal Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw graphs of simple cubic functions using a table of values.**	• In this lesson, we will learn how to draw graphs of simple cubic functions using a table of values.
2.	**Sketch graphs of simple cubic functions, given as three linear expressions.**	• In this lesson, we will sketch graphs of simple cubic functions, given as three linear expressions. We will calculate a set of coordinates and sketch the cubic function from these.
3.	**Interpret graphs of simple cubic functions, including finding solutions to cubic equations**	• In this lesson, we will interpret graphs of simple cubic functions, including finding estimated solutions to cubic equations.
4.	**Recognise, draw, sketch and interpret graphs of the reciprocal function $y = 1/x$**	• In this lesson, we will recognise, draw, sketch and interpret graphs of the function $y = 1/x$. We will investigate the pattern of behaviours of general graphs of the form a/x.

Unit 54 Travel Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Distance-time graphs	• In this lesson, we will interpret distance-time graphs. We will answer questions regarding how far or how long a journey has been at different points, segments, and overall.
2.	Calculate speed from distance time-graphs	• In this lesson, we will calculate speed from distance time-graphs. We will introduce the formula used to calculate this measure, and discuss how to interpret it.
3.	Acceleration from a velocity-time graph	• In this lesson, we will calculate acceleration from a velocity-time graph. We will introduce a formula that aids our calculation, and practise using it to determine different accelerations in velocity-time graphs.
4.	Velocity-time graphs	• In this lesson, we will interpret velocity-time graphs. We will discuss the notion of constant speed, and what each measure means.

Unit 55 Graphs of Inequalities

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Represent inequalities on a coordinate grid 1**	• In this lesson, we will learn how to represent inequalities of the form y > a on a coordinate grid.
2.	**Represent inequalities on a coordinate grid 2**	• In this lesson, we will learn how to represent inequalities of the form y > ax + b on a coordinate grid.
3.	**Shade in the region defined by several inequalities**	• In this lesson, we will learn how to shade a region on a coordinate grid that satisfies two or more inequalities.
4.	**Identify inequalities that make up a shaded region**	• In this lesson, we will learn how to identify inequalities that make up more complex shaded regions.

Unit 56 Compound measures

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use and apply the speed formula**	• In this lesson, we will perform calculations involving speed, distance and time and learn about the units involved.
2.	**Use and apply the density formula**	• In this lesson, we will perform calculations involving mass, density and volume and learn about the units involved.
3.	**Use and apply the pressure formula**	• In this lesson, we will perform calculations involving pressure, force and area and learn about the units involved.
4.	**Solve simple kinematics problems (velocity, initial velocity and acceleration formulae)**	• In this lesson, we will begin to learn about Kinematics, substitute into the SUVAT equations and apply the SUVAT equations to problems.

Unit 57 Volume and Surface Area 1 & 2

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Volume of Cubes and Cuboids**	• In this lesson, students will calculate the volume of cubes and cuboids. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
2.	**Finding the Volume of Triangular Prisms**	• In this lesson, students will calculate the volume of triangular prisms. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
3.	**Finding the Surface Area of Triangular Prisms**	• In this lesson, students will calculate the surface area of triangular prisms. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.

4.	**Finding the Surface Area of Cubes and Cuboids**	• In this lesson, students will calculate the surface area of cubes and cuboids. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
5.	**Volume and surface area of a pyramid**	• In this lesson, we will calculate the volume and surface area of a pyramid. We will learn how to use the formulae for these calculations and model step by step solutions.
6.	**Volume and surface area of a cone**	• In this lesson, we will learn how to calculate the volume and surface area of a cone. We will model the suitable formulae and work through examples.
7.	**Volume and surface area of a sphere**	• In this lesson, we will calculate the volume and surface area of a sphere. We will explore the formulae for these calculations and model step by step worked examples.
8.	**Volume and surface area of composite solids**	• In this lesson, we will calculate the volume and surface area of composite solids. We will deconstruct these shapes to help identify what formulae to use to work out the total volume and surface area.

Unit 58 Translate and Vectors 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Translate and describe an object given a horizontal or vertical instruction**	• In this lesson, we will translate images in horizontal and vertical directions on a squared grid given worded instructions.
2.	**Represent a column vector as a diagram and using notation**	• In this lesson, we will investigate column vectors and their representative diagrams.
3.	**Write a column vector from a diagram**	• In this lesson, we will accurately determine a column vector from a given diagram.
4.	**Translate and describe a 2D vector**	• In this lesson, we will understand the meaning of a 2D vector, and use them to translate objects and describe translations.

Unit 59 Vectors 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Add two column vectors (including diagrams) to give a resultant vector**	• In this lesson, we will learn how to perform addition using column vectors. We will investigate this process using diagrams.
2.	**Add and subtract two column vectors to give a resultant vector (Part 1)**	• In this lesson, we will practise adding and subtracting column vectors. We will investigate this process using diagrams.
3.	**Multiply a vector by a scalar**	• In this lesson, we will multiply a vector by a given scalar. We will explore this process and make sense of it with suitable diagrams.
4.	**Add and subtract two column vectors to give a resultant vector (Part 2)**	• In this lesson, we will add and subtract column vectors. We will model more complicated examples that use multiples of vectors. We will interpret our answers using suitable diagrams.

Unit 60 Constructions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Construct triangles**	• In this lesson, we will accurately construct triangles using a protractor and ruler when given angle and length measurements.
2.	**Construct a perpendicular bisector**	• In this lesson, we will learn how to construct a perpendicular bisector using a compass, ruler, pencil and paper.
3.	**Construct a perpendicular bisector from a point to a line**	• In this lesson, we will learn how to construct a perpendicular bisector from a point to a line using a compass, ruler, pencil and paper.
4.	**Construct an angle bisector**	• In this lesson, we will learn how to construct an angle bisector using a compass, ruler, pencil and paper.

Unit 61 Loci

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Loci around a point	• In this lesson, we will learn how to draw the locus of points around a single point using a compass, ruler, pencil and paper.
2.	Loci from a line	• In this lesson, we will learn how to draw the locus of points that are a given distance from a line segment. We will do this using a compass, ruler, pencil and paper.
3.	Loci from a shape	• In this lesson, we will learn how to draw the locus of points a given distance from a shape. We will do this using a compass, ruler, pencil and paper.
4.	Equidistant from two points	• In this lesson, we will learn how to draw the locus of points equidistant from two given points. We will do this using a compass, ruler, pencil and paper.

4. Learn More

Learn more contents

These are the different sections that you will find in the learn more section of the Key Stage 4 maths long curriculum plan:

Section number	Section content
1.	Key stage 4 maths introduction
2.	Coherence and flexibility
3.	Knowledge organisation
4.	Knowledge selection
5.	Inclusive and ambitious
6.	Pupil engagement
7.	Motivation through learning

1. Key Stage 4 Maths Introduction

As mathematics teachers we want our pupils to reach fluency in what we are teaching them. In mathematics, fluency requires a deep understanding of concepts and the ability to apply them flexibly and with automaticity. The mathematics curriculum uses multiple representations to help make connections across concepts to help build a deep conceptual understanding. By making consistent use of the same core representations we will scaffold pupils' thinking to help them understand abstract mathematical concepts. The curriculum will also include intelligent practice that is designed to help pupils develop automaticity in their mathematics.

We also aim for our pupils to be able to use the precise language of mathematics, as distinct from everyday language. The curriculum will do this by explicitly teaching mathematical vocabulary and introducing core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

Finally, we also aim for our pupils to be able to think mathematically. The tasks and activities used in the curriculum teach pupils the components of mathematical thinking: to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

Below are the set of principles we have used to build this curriculum, with these ambitions for our pupils in mind.

2. Coherence and flexibility

We strive to support schools by offering a maths curriculum that can fit alongside a range of existing structures. However, complete flexibility over unit ordering is impossible due to the cumulative nature of mathematics and the importance of prior knowledge.

We have grouped lessons into units: coherent sequences of 5 or more lessons. Although each lesson can be accessed individually, explicit connections are made to earlier lessons and later lessons in the same unit. This is because the connections between mathematical concepts are so vital to deepening understanding.

3. Knowledge organisation

The units in the maths curriculum have been organised by strand. We have also created a set of sequences for pupils targeting different grades at GCSE and who are at different stages in KS4, organised based on the topics that are most useful for the GCSE course.

4. Knowledge selection

Our mathematics lessons cover the full scope of the National Curriculum. We have given more time (both in number of lessons and number of units) to those concepts within the National Curriculum that the evidence tells us are foundational to success in maths.

5. Inclusive and ambitious

We know the difference it makes when children believe they “can do” maths. We are guided by the principles of the National Curriculum to ensure that every pupil, regardless of starting point, develops their fluency, reasoning and problem solving. Our activities are scaffolded so all children can succeed. Pupils are offered frequent opportunities to be and feel successful in their maths education.

We develop conceptual understanding by always building new understanding on what pupils already know, by representing concepts in different ways, and by making connections between concepts. The mathematics curriculum makes consistent use of the same core representations across year groups to help pupils connect prior learning to new learning. These representations are selected to make key mathematical structures and ideas accessible to all pupils, no matter what their starting points.

To support every child to communicate mathematically, pupils are introduced to core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

6. Pupil engagement

You learn maths by thinking about maths. Our lessons include mathematical tasks which have multiple solutions. Mathematical thinking is woven into the units using scaffolds and prompts such as ‘what is the same and what’s different?’, ‘is it sometimes, always or never true?’ and ‘which could be the odd one out?’. Throughout the curriculum, all pupils have opportunities to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

7. Motivation through learning

We believe that mathematics is inherently interesting and that all children are entitled to a genuine experience of mathematics. The tasks and activities that pupils engage with harness innate ways of thinking and develop the habits of mind that are drawn upon when being mathematical. Problem solving is at the heart of every lesson with opportunities to investigate, explore and reason.

Maths
Key Stage 4 - Higher

Curriculum document

1. Philosophy

Six underlying attributes at the heart of Oak's curriculum and lessons.

Knowledge and vocabulary is explicity taught across units and lessons so that pupils build on what they already know to develop powerful knowledge.

Knowledge is **sequenced** and mapped coherently so that pupils make meaningful connections

Curriculum **flexibility** enables schools to tailor their use of Oak to their curricula and context.

Addresses the needs of all learners through adherence to **accessibility** guidelines and requirements.

Rigorous application of the science of learning and best practise ensures learning is **informed by evidence**.

Commitment to **diversity** in our teaching, out teachers and in the language, texts and media we use so that all pupils feel positively represented.

2. Units

KS4 Maths is formed of 63 units and this is the recommended sequence:

Unit Title	Recommended year group	Number of lessons
1 Simplifying Surds	Year 10	4
2 Adding surds	Year 10	4
3 Multiplying Surds	Year 10	4
4 Dividing and Rationalising surds	Year 10	4
5 Solving equations 2 (Simple algebraic fractions)	Year 10	4
6 Algebraic Fractions	Year 10	4
7 Factorise and solve a quadratic (a=1)	Year 10	4
8 Factorise and solve quadratics (a > 1)	Year 10	4
9 Substitution and Rearranging formulae	Year 10	4

10	Further Algebra (Change the subject/Binomial expansion)	Year 10	4
11	Similarity	Year 10	4
12	Trigonometry 1	Year 10	4
13	Trigonometry 2	Year 10	4
14	Trigonometry 3	Year 10	4
15	Types of Numbers and Rules of Indices	Year 10	8
16	Negative and Fractional Indices	Year 10	4
17	Recurring decimals	Year 10	4
18	Upper and Lower Bounds	Year 10	4
19	Straight Line Graphs (y=mx+C)	Year 10	4
20	Straight Line Graphs 2 (Parallel Lines)	Year 10	4
21	Higher Straight lines (Perpendicular Lines)	Year 10	4

22	Simultaneous Equations (Linear)	Year 10	4
23	Scatter Diagrams & Frequency Trees & Averages	Year 10	8
24	Higher Data 1 (CF and Box Plots)	Year 10	4
25	Probability 2 (Sample space, Venn diagrams and experimental)	Year 10	4
26	Higher Probability (Conditional and Further Set Notation)	Year 10, Year 11	4
27	Further Quadratic equations	Year 10	4
28	Quadratic Graphs 1 (a=1)	Year 10	4
29	Quadratic Graphs 2 (a>1)	Year 10	4
30	Quadratic sequences	Year 10	4
31	One linear and one quadratic simultaneous equations	Year 10	4
32	Parts of a Circle 1 & 2	Year 10	8
33	Volume and Surface Area 1 (Prisms)	Year 10	4

34	Volume 2	Year 10	4
35	Surface Area 2	Year 10	4
36	Volume and Surface Area 2	Year 10	4
37	Advanced Trigonometry 1	Year 10	4
38	Advanced Trigonometry 2	Year 10	4
39	Advanced Trigonometry 3	Year 10	4
40	Circle Theorems 1	Year 11	4
41	Circle Theorems 2	Year 11	4
42	Constructions & Loci	Year 11	8
43	Solve equations numerically (Iteration)	Year 11	4
44	Direct and Inverse Proportion	Year 11	4
45	Functions	Year 11	4

46	Further Algebraic Fractions	Year 11	4
47	Algebraic Proof	Year 11	4
48	Circle Graphs	Year 11	4
49	Probability 3 (Tree diagrams)	Year 11	4
50	Histograms	Year 11	4
51	Data Collection Higher	Year 11	4
52	Revise - Linear and Quadratic Graphs	Year 11	12
53	Cubic and Reciprocal Graphs	Year 11	4
54	Other Graphs (Trig, Exponetial and Transformations)	Year 11	4
55	Further graphs (Gradients/Area of curves)	Year 11	4
56	Graphs of Inequalities	Year 11	4
57	Compound measures	Year 11	4

58	Volume and Surface Area Higher 3	Year 11	4
59	Translate and Vectors 1	Year 11	4
60	Vectors 2	Year 11	4
61	Higher Vectors 1	Year 11	4
62	Higher Vectors 2 and Congruent Triangles	Year 11	3
63	Enlargement and Similarity	Year 11	4

3. Lessons

Unit 1 Simplifying Surds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Identify rational and irrational numbers**	• In this lesson, we will learn the definitions of rational and irrational numbers and how to identify and interpret them.
2.	**Simplify simple surds**	• In this lesson, we will simplify surds of the form âˆšb. We will use our knowledge of factors and square roots to reduce surds to their simplest form.
3.	**Simplify a surd of the form aâˆšb**	• In this lesson, we will simplify surds of the form aâˆšb. We will use our knowledge of factors and square roots to reduce surds to their simplest form.
4.	**Write aâˆšb in form âˆšx**	• In this lesson, we will write surds of the form aâˆšb in the form âˆšx. We will use our knowledge of factors and square roots to reduce surds to their simplest form.

Unit 2 Adding surds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Subtract two surds**	• In this lesson, we will learn how to subtract one surd from another where no prior simplification is needed.In these cases, the surds will all have the same root.
2.	**Add two surds**	• In this lesson, we will learn how to add two or more surds where no prior simplification is needed.In these cases, the surds will all have the same root.
3.	**Add two surds where you need to simplify**	• In this lesson, we will learn how to add two surds where you may need to simplify at least one surd prior to adding.
4.	**Subtract two surds where you need to simplify**	• In this lesson, we will learn how to subtract two surds where you may need to simplify at least one surd prior to subtracting.

Unit 3 Multiplying Surds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Multiply Two Surds and Simplify**	• In this lesson, we will learn how to multiply two surds together. We will investigate how to simplify our answer and interpret it correctly.
2.	**Multiply Two Surds with Coefficients**	• In this lesson, we will learn how to multiply two surds which each have coefficients greater than one.
3.	**Expand Single Brackets Containing a Surd**	• In this lesson, we will learn how to expand brackets containing surds. We will use our knowledge of combining like terms and multiples and factors to help simplify our answers.
4.	**Expand Double Brackets Containing Surds**	• In this lesson, we will learn about expanding double brackets containing surds. We will use our knowledge of combining like terms and multiples and factors to help simplify our answers.

Unit 4 Dividing and Rationalising surds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Dividing Surds (Part 1)	• In this lesson, we will learn how to divide two surds. We will look at simple division of surds where one is a multiple of the other.
2.	Dividing Surds (Part 2)	• In this lesson, we will learn how to divide two surds in cases where at least one surd has a coefficient greater than one.
3.	Rationalising Surds (Part 1)	• In this lesson, we will learn how to rationalise a fraction with a surd in the denominator. We will investigate the concept of rationalising a denominator and explain why this helps simplify our fraction.
4.	Rationalising Surds (Part 2)	• In this lesson, we will learn how to rationalise a fraction containing more complex expressions with surds in the denominator.

Unit 5 Solving equations 2 (Simple algebraic fractions) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving algebraic fractions (one fraction equal to another)**	• In this lesson, we will be solving algebraic fractions where one fraction is equal to another fraction.
2.	**Solve simple algebraic fractions (equal to a number)**	• In this lesson, we will solve equations with algebraic fractions equal to a number.
3.	**Solve equations that first involve simplification 2 (x + 3) + 5x = 15**	• In this lesson, we will solve equations that first need some type of simplification.
4.	**Solving algebraic fractions (equal to x + a)**	• In this lesson, we will solve equations with an algebraic fraction equal to a number and an unknown value.

Unit 6 Algebraic Fractions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Add two algebraic fractions with integer denominators**	• In this lesson, we will learn how to add two algebraic fractions together that have integer denominators by finding common denominators.
2.	**Subtract two algebraic fractions with an integer denominator**	• In this lesson, we will learn how to subtract two algebraic fractions together that have integer denominators by finding common denominators.
3.	**Solving equations involving adding two fractions**	• In this lesson, we will learn how to add two algebraic fractions together. We will look at cases that share a common denominator, have different denominators, and perimeter contextual questions.
4.	**Solving equations involving subtracting two fractions**	• In this lesson, we will learn how to subtract two algebraic fractions together. We will look at cases that share a common denominator, have different denominators..

Unit 7 Factorise and solve a quadratic (a=1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Factorise a quadratic	• In this lesson, we will learn how to factorise a quadratic expression into two brackets
2.	Factorise a quadratic (difference of two squares)	• In this lesson, we will learn how to factorise a quadratic expression as a difference of two squares
3.	Solve a quadratic equation by factorising	• In this lesson, we will learn how to solve a quadratic equation by factorising the expression to determine what values produce a zero multiplier.
4.	Simplifying an algebraic fraction by factorising	• In this lesson, we will learn how to simplify algebraic fractions by factorising and identifying common factors in both the numerator and denominator.

Unit 8 Factorise and solve quadratics (a > 1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Factorise a quadratic (Higher)**	• In this lesson, we will learn how to factorise a quadratic with a leading coefficient greater than 1.
2.	**Factorise a quadratic (difference of two squares) - Higher**	• In this lesson, we will learn how to factorise a difference of two squares with a leading coefficient greater than 1.
3.	**Simplifying an algebraic fraction by factorising (Higher)**	• In this lesson, we will learn how to simplify algebraic fractions involving quadratic expressions with leading coefficients greater than 1.
4.	**Solve a quadratic equation by factorising (Higher)**	• In this lesson, we will learn how to solve a quadratic equation with a leading coefficient greater than 1.

Unit 9 Substitution and Rearranging formulae

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Change the subject of a formula**	• In this lesson, we will change the subject of a formula in which the term appears once.
2.	**Change the subject of a formula with squares and square roots**	• In this lesson, we will change the subject of a formula where the formula involves squares and square roots and the term only appears once.
3.	**Substitute a positive term into a formula**	• In this lesson, we will be substituting positive values into a variety of formulae and calculating the result.
4.	**Substitute a negative term into a formula**	• In this lesson, we will be substituting negative values into a variety of formulae, and calculating the result.

Unit 10 Further Algebra (Change the subject/Binomial expansion) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Change the subject where the unknown appears twice**	• In this lesson, we will be changing the subject of a formula in which the unknown appears twice.
2.	**Change the subject where the unknown appears twice in an algebraic fraction**	• In this lesson, we will be changing the subject of a formula in which the unknown appears twice, involving algebraic fractions.
3.	**Expand product of more than two binomials**	• In this lesson, we will multiply more than two binomials together. We will use the grid method to calculate algebraic multipllication using 3 pairs of brackets.
4.	**Expand linear and quadratic expressions**	• In this lesson, we will multiply a quadratic expression by a linear expression.

Unit 11 Similarity

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find missing lengths in similar separate shapes**	• In this lesson, we will use scale factors to find missing side lengths in similar shapes. We will practise using our knowledge of proportion to calculate missing lengths.
2.	**Identify similar shapes and show shapes are similar**	• In this lesson, we will learn the conditions for shapes to be similar and identify similar shapes. We will learn how to identify the properties of a similar shape to help us determine when a shape is, or is not, similar to another.
3.	**Find missing lengths in similar shapes which have sides overlapping**	• In this lesson, we will find missing side lengths for similar shapes which have side lengths overlapping
4.	**Identify congruent shapes**	• In this lesson, we will learn about the conditions for congruent shapes and identify congruent shapes.

Unit 12 Trigonometry 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Know tangent, sine and cosine	• In this lesson, we will learn how to correctly label a right-angled triangle, and identify the correct trigonometric ratio to use.
2.	Applying Trigonometry	• In this lesson, we will apply and manipulate the full compliment of trigonometric ratios to solve missing length triangle problems.
3.	Use sine and cosine to find a length	• In this lesson, we will calculate missing lengths using sine and cosine trigonometric ratios.
4.	Use tangent to find a length	• In this lesson, we will calculate missing lengths using the tangent trigonometric ratio.

Unit 13 Trigonometry 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use trigonometry to find the perpendicular height of a triangle**	• In this lesson, we will identify the perpendicular height of triangles, use trigonometry to find the perpendicular height and apply this to find the area of a triangle.
2.	**Solve basic trigonometry equations**	• In this lesson, we will use a calculator to work out values of angles by rearranging trigonometric equations relating to sides and angles and using inverse trigonometric functions.
3.	**Use inverse functions to find an angle**	• In this lesson, we will find a missing angle in a given triangle using the inverse trigonometric functions. We will need to interpret which trigonometric ratio to use, and rearrange it.
4.	**Solve problems mixing angles and sides**	• In this lesson, we will apply trigonometry to multi-step problems by finding missing sides and missing angles

Unit 14 Trigonometry 3

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Know when to use Pythagoras or Trigonometry to solve problems**	• In this lesson, we will recognise when it is appropriate to use Pythagoras or Trigonometry when finding missing lengths and angles in right angle triangles.
2.	**Use trigonometry to solve bearing problems**	• In this lesson, we will apply prior knowledge of bearings and trigonometry to solve problems.
3.	**Substitute the exact values to find a missing length**	• In this lesson, we will find a missing length of a right angled triangle using prior knowledge of exact trigonometry ratios for 0Â°, 30Â°,45Â°,60Â° and 90Â°
4.	**Know the trigonometry ratios for 0Â°, 30Â°, 45Â°, 60Â° and 90Â°**	• In this lesson, we will use an equilateral triangle and an isosceles triangle to work out the exact values for trigonometry ratios for 0Â°, 30Â°,45Â°,60Â° and 90Â°

Unit 15 Types of Numbers and Rules of Indices

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Square and cube numbers	• In this lesson, we will investigate the properties of square and cube numbers. We will model what these number categories are using visual models of arrays and stacked cubes, and will pracise calculating squaring and cubing a number.
2.	Square roots and cube roots	• In this lesson, we will investigate the properties of square and cube roots. We will look at common terminology, symbols, and how to calculate and interpret square and cube roots of integers.
3.	Higher powers	• In this lesson, we will learn about using indices greater than 3. We will make sense of numbers written with an index greater than 3, and learn how to calculate the value of those numbers.

4.	**Higher roots**	• In this lesson, we will investigate higher roots of numbers. This is an extension of square and cube roots. We will make sense of numbers written with higher roots, and learn how to calculate the value of those numbers.
5.	**Multiply powers**	• In this lesson we will learn how to apply and obey index laws when multiplying numbers with powers.
6.	**Divide powers**	• In this lesson we will learn how to apply and obey index laws when dividing numbers with powers.
7.	**Powers of powers**	• In this lesson we will learn how to apply index laws when raising numbers with powers to another power.
8.	**Manipulating powers**	• In this lesson, we will learn how to manipulate powers to change bases. We will learn how to identify when this is and is not possible.

Unit 16 Negative and Fractional Indices

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Negative integer indices and the power of zero**	• In this lesson, we will learn about negative index numbers and a number to the power of zero. We will investigate what they mean and how they make sense.
2.	**Fractional indices**	• In this lesson, we will learn how to interpret numbers with a fraction as the index number.
3.	**Fractional indices (advanced)**	• In this lesson, we will investigate and deconstruct more advanced fractional indices. We will explore strategies to understand what numbers they represent.
4.	**Negative and fractional indices (mixed skills)**	• In this lesson, we will utilise a combination of skills working with negative and fractional index numbers. We will model and solve problems involving these cases.

Unit 17 Recurring decimals

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Write a fraction as a recurring decimal using division**	• In this lesson, we will apply the different strategies learnt in this unit to upper and lower bound problems. We will investigate the difference between terminating and recurring decimals and write a fraction as a recurring decimal using short division.
2.	**Recurring decimals where one number repeats**	• In this lesson, we will change recurring decimals, where one number repeats, into fractions using algebraic methods
3.	**Recurring decimals where two or more numbers repeat**	• In this lesson, we will change recurring decimals where 2 or more numbers repeat into fractions using algebraic methods
4.	**Recurring decimals where one number after the decimal point is fixed and the others repeat**	• In this lesson, we will change recurring decimals where one number after the decimal point is fixed and the others repeat, into fractions using algebraic methods

Unit 18 Upper and Lower Bounds

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Upper and lower bounds: Error intervals**	• In this lesson, we will learn how to write error intervals using inequality notation. We will explore the concept of error intervals and learn the correct notation for these cases.
2.	**Upper and lower bounds: Adding and subtracting**	• In this lesson, we will learn how to add and subtract numbers that each have upper and lower bounds. We will explore what the maximum and minimum values of our calculations will be when considering these bounds.
3.	**Upper and lower bounds: Multiplying and dividing**	• In this lesson, we will be multiplying and dividing numbers that each have upper and lower bounds. We will explore what the maximum and minimum values of our calculations will be when considering these bounds.
4.	**Upper and lower bounds: Application of skills**	• In this lesson, we will be applying a variety of strategies learnt in the previous lessons to help us solve upper and lower bound problems. We will be modelling problems that involve finding error intervals and boundaries.

Unit 19 Straight Line Graphs (y=mx+C)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the gradient of a line**	• In this lesson, we will revise the term 'gradient' and learn how to identify and calculate the gradient of a plotted line using two pairs of coordinates. We will compare lines with different gradients.
2.	**Find the equation of a straight line using y=mx+c**	• In this lesson, we will find the equation of a straight line using y=mx+c. We will use coordinates taken from a plotted straight line to help us calculate the gradient, then use a method of substitution to find the equation of the line.
3.	**Using gradient to solve problems with parallel lines**	• In this lesson, we will use the gradient of a line to solve problems with parallel lines. We will investigate the relationship between different linear graphs with the same gradient.
4.	**Find the intercept and gradient from a line given in any form**	• In this lesson, we will investigate different strategies to find the intercept and gradient for a linear graph. Each method will utilise the equation of the line.

Unit 20 Straight Line Graphs 2 (Parallel Lines)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Interpret gradient and intercept on real life graphs**	• In this lesson, we will calculate and interpret the gradient and intercepts on real life graphs. We will draw upon our skills of drawing triangles to calculate gradients.
2.	**Write the equation of a straight line if parallel to a line and passing through any point**	• In this lesson, we will investigate how to calculate the equation of a straight line that is parallel to an existing line, and passes through a known coordinate.
3.	**Find the equation of a straight line through two given points**	• In this lesson, we will investigate how to calculate the equation of a line, given two pairs of coordinates that the line passes through.
4.	**Write the equation of a straight line if parallel to a line and passing through (0,n)**	• In this lesson, we will investigate how to calculate the equation of a straight line that is parallel to an existing line, and passes through a known point on the y-axis.

Unit 21 Higher Straight lines (Perpendicular Lines)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Prove two lines are perpendicular**	• In this lesson, we will investigate how to formally prove or disprove whether two lines are perpendicular.
2.	**Work out the equation of the perpendicular bisector of a line segment**	• In this lesson, we will work out equation of a line that is the perpendicular bisector of a given line segment.
3.	**Work out gradient of line perpendicular to a given line**	• In this lesson, we will investigate the the gradient of a line that is perpendicular to a given line. We will use knowledge of reciprocals to calculate the gradient of perpendicular lines.
4.	**Work out equation of the line perpendicular that passes through a given point**	• In this lesson, we will work out the gradient of a line that is perpendicular to a given line, with the added constraint that passes through a given point.

Unit 22 Simultaneous Equations (Linear) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solve linear simultaneous equations where one of the coefficients is equal**	• In this lesson, we will introduce solving simultaneous equations pictorially, then solve algebraically using subtraction and addition. We will look at cases where the coefficients of either x or y are equal.
2.	**Solve linear simultaneous equations where you need to multiply one of the equations**	• In this lesson, we will solve simultaneous equations using the visual representation of a bar model to help us derive values for unknowns in linear equations.
3.	**Solve linear simultaneous equations where you need to multiply both equations**	• In this lesson, we will investigate how to solve simultaneous equation cases where the coefficient of one term is not a multiple or factor of the other. We will use multiplication to find new equations and create common coefficients.
4.	**Solve linear simultaneous equations where you need to first rearrange**	• In this lesson, we will investigate how to solve simultaneous equation cases where we need to rearrange equations first, followed by using multiplication to ensure coefficients in one equation are factors or multiples of the other.

Unit 23 Scatter Diagrams & Frequency Trees & Averages — 8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Mean from a frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a frequency table.
2.	**Mean from a grouped frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a grouped frequency table.
3.	**Find the mean, median, mode and range from a list of numbers**	• In this lesson, we will learn how to calculate the mean, median, mode and range from a list of numbers
4.	**Stem and leaf diagrams**	• In this lesson, we will learn how to draw and interpret stem and leaf diagrams.
5.	**Use a line of best fit on a scatter graph**	• In this lesson, we will learn how to draw and interpret a line of best fit on a scatter graph
6.	**Draw and interpret a frequency tree**	• In this lesson, we will learn how to draw and interpret a frequency tree diagram.

7.	**Plot a scatter graph and describe correlation**	• In this lesson, we will learn how to plot a scatter graph. We will also learn about different types of correlation in scatter graphs, and be able to correctly identify correlation patterns in scatter graphs.
8.	**Identify and explain outliers from a scatter diagram**	• In this lesson, we will learn to identify and explain outliers from a scatter diagram

Unit 24 Higher Data 1 (CF and Box Plots)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Plot a cumulative frequency diagram**	• In this lesson, we will learn how to plot a cumulative frequency diagram. We will learn how to interpret and solve questions around cumulative frequency diagrams
2.	**Find quartiles and interquartile range from CF diagram**	• In this lesson, we will calculate the median, upper and lower quartiles and the interquartile range from a cumulative frequency diagram
3.	**Find quartiles from a list of data**	• In this lesson, we will calculate the median, upper and lower quartiles and the interquartile range for a data set.
4.	**Plot a box plot and compare distributions**	• In this lesson, we will construct box plots and read data from them including comparing data from two or more distributions

Unit 25 Probability 2 (Sample space, Venn diagrams and experimental)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**List outcomes in a sample space diagram (two-way table) and calculate probabilities**	• In this lesson, we will learn how to construct and interpret sample space diagrams (two-way tables) including calculating probabilities, for a variety of contexts.
2.	**Calculate experimental probabilities and make predictions (relative frequency)**	• In this lesson, we will learn how to record data in a relative frequency table and use the probabilities to make predictions, including scenarios such as spinners or rolling dice.
3.	**Find probabilities from Venn diagrams including basic set notation**	• In this lesson, we will learn how to calculate probabilities from Venn diagrams with 2 or more sets, including using the correct notation for union, intersect and complement. It is useful to have a knowledge of how to draw Venn diagrams prior to this lesson but this skill is revised.

4. **Find probabilities from frequency trees**

- In this lesson, we will learn how to use frequency trees to find probabilities including revision on how to draw frequency trees given some information.

Unit 26 Higher Probability (Conditional and Further Set Notation) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Conditional probability word problems**	• In this lesson, we will learn how to tackle conditional probability word problems. Prior knowledge of how to draw tree diagrams is essential to this lesson.
2.	**Conditional probability from a two-way table**	• In this lesson, we will interpret two-way tables and find conditional probabilities from them.
3.	**Probability from a venn diagram using further set notation (2 sets)**	• In this lesson, we will interpret Venn diagrams with two sets and find probabilities, including conditional probabilities from them, using the correct set notation.
4.	**Probability from a venn diagram using further set notation (3 sets)**	• In this lesson, we will interpret Venn diagrams with three sets and find probabilities, including conditional probabilities from them, using the correct set notation.

Unit 27 Further Quadratic equations

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use formulae to solve quadratic equations (any value)**	• In this lesson, we will use the quadratic formula to solve quadratic equations (any value)
2.	**Complete the square (a = 1)**	• In this lesson, we will introduce a method for solving quadratic equations called 'completing the square'. We will learn how to complete the square in cases where a = 1.
3.	**Use formulae to solve quadratic equations (b is positive)**	• In this lesson, we will use the quadratic formula to solve quadratic equations where the value of b is positive.
4.	**Solve quadratic equations by completing the square**	• In this lesson, we will learn how to use completing the square to solve quadratic equations. We will look at cases that involve integers and fractions.

Unit 28 Quadratic Graphs 1 (a=1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Plot simple quadratic equations**	• In this lesson, we will plot graphs of simple quadratic equations and recognise some of their properties. We will determine the general features of quadratic graphs.
2.	**Solving Quadratic Equations Graphically**	• In this lesson, we will interpret graphs of quadratic equations in order to find their solutions. We will investigate the key features of quadratic graphs that help us identify their solutions.
3.	**Identify and interpret roots, intercepts and turning points of quadratic graphs**	• In this lesson, we will recognise the roots, y-intercept and turning points on a graph of a quadratic function. We will define these key terms and investigate quadratic curves to help label them with this new vocabulary.
4.	**Plot other quadratic equations**	• In this lesson, we will plot graphs of quadratic equations of the form axÂ^{2} + bx + c and recognise some of their properties. We will investgate how different coefficients alter the appearance of the quadratic curve.

Unit 29 Quadratic Graphs 2 (a>1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving quadratic equations, given a different quadratic, using a sketch**	• In this lesson, we will learn how to solve quadratic equations, given a different quadratic, using a sketch.
2.	**Draw quadratic graphs (a > 1)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of xÂ² is greater than 1
3.	**Draw quadratic graphs (negative x squared)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of xÂ² is negative.
4.	**Solve quadratic graphs = 0, = a and = ax + b**	• In this lessons we will learn how to use graphs to find solutions to equations where one is quadratic and one is linear.

Unit 30 Quadratic sequences

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the nth term of a quadratic sequence**	• In this lesson, we will find the nth term of a quadratic sequence by using a table of values and finding the second difference between terms.
2.	**Solve quadratic inequalities (a = 1)**	• In this lesson, we will solve quadratic inequalities with an xÂ² coefficient of 1 and express solutions using set notation.
3.	**Solve simple quadratic inequalities**	• In this lesson, we will solve simple quadratic inequalities and express solutions using set notation.
4.	**Solve quadratic inequalities (a > 1)**	• In this lesson, we will solve quadratic inequalities with an xÂ² coefficient greater than 1 and express solutions using set notation.

Unit 31 One linear and one quadratic simultaneous equations 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Understanding solutions to equations with respect to their graphs**	• In this lesson, we will investigate solutions to simultaneous equations by reading the coordinates of points of intersection in examples including linear, quadratic and circle graphs
2.	**Solve where ð’š = and ð’š = (setting the equations equal to one another)**	• In this lesson, we will solve simultaneous equations by equating the two equations, then solve them by factorising, rearranging or the quadratic formula.
3.	**Solve where ð’™Â² + ð’šÂ² = ð’“ and ð’™ + ð’š = ðŸ‘ (substituting)**	• In this lesson, we will solve simultaneous equations by substituting a linear equation into a quadratic equation. Examples include quadratics of the form ð’™Â² + ð’šÂ² = ð’“, where r can be a square number.
4.	**Solve where xy = a and y = 2x + 1 (substituting)**	• In this lesson, we will solve simultaneous equations using substitution. You need to be confident in solving quadratics by factorisation and by the quadratic formula before starting this lesson.

Unit 32 Parts of a Circle 1 & 2

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Know the parts of a circle**	• In this lesson, we will identify parts of a circle by their mathematical names
2.	**Find the area of a semicircle and quarter circle**	• In this lesson, we will find the area of a semicircle and quarter circle in terms of pi or to 3 significant figures
3.	**Find the area of a sector**	• In this lesson, we will find the area of sectors in terms of pi or to 3 significant figures
4.	**Find the radius or diameter given the area of a sector**	• In this lesson, we will find the radius or diameter given the area of a sector
5.	**Find the length of an arc on a semicircle and quarter circle and the perimeter of a semicircle and quarter circle**	• In this lesson, we will find the length of an arc on a semicircle and quarter circle and the perimeter of a semicircle and quarter circle

6.	**Find the length of an arc and the perimeter of a sector**	• In this lesson, we will find the length of an arc and the perimeter of a semicircle
7.	**Use the arc length to find the radius or angle of a sector**	• In this lesson, we will use the arc length to find the radius or angle of the sector
8.	**Calculate area of compound shapes with circles**	• In this lesson, we will calculate the area of compound shapes that include circles or parts of circles.

Unit 33 Volume and Surface Area 1 (Prisms)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Volume of Cubes and Cuboids**	• In this lesson, students will calculate the volume of cubes and cuboids. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
2.	**Finding the Volume of Triangular Prisms**	• In this lesson, students will calculate the volume of triangular prisms. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
3.	**Finding the Surface Area of Triangular Prisms**	• In this lesson, students will calculate the surface area of triangular prisms. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.

4.	**Finding the Surface Area of Cubes and Cuboids**	• In this lesson, students will calculate the surface area of cubes and cuboids. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.

Unit 34 Volume 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Volume and surface area of a pyramid**	• In this lesson, we will calculate the volume and surface area of a pyramid. We will learn how to use the formulae for these calculations and model step by step solutions.
2.	**Volume and surface area of a cone**	• In this lesson, we will learn how to calculate the volume and surface area of a cone. We will model the suitable formulae and work through examples.
3.	**Volume and surface area of a sphere**	• In this lesson, we will calculate the volume and surface area of a sphere. We will explore the formulae for these calculations and model step by step worked examples.
4.	**Volume and surface area of composite solids**	• In this lesson, we will calculate the volume and surface area of composite solids. We will deconstruct these shapes to help identify what formulae to use to work out the total volume and surface area.

Unit 35 Surface Area 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Volume and surface area of a pyramid**	• In this lesson, we will calculate the volume and surface area of a pyramid. We will learn how to use the formulae for these calculations and model step by step solutions.
2.	**Volume and surface area of a cone**	• In this lesson, we will learn how to calculate the volume and surface area of a cone. We will model the suitable formulae and work through examples.
3.	**Volume and surface area of a sphere**	• In this lesson, we will calculate the volume and surface area of a sphere. We will explore the formulae for these calculations and model step by step worked examples.
4.	**Volume and surface area of composite solids**	• In this lesson, we will calculate the volume and surface area of composite solids. We will deconstruct these shapes to help identify what formulae to use to work out the total volume and surface area.

Unit 36 Volume and Surface Area 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Volume and surface area of a pyramid**	• In this lesson, we will calculate the volume and surface area of a pyramid. We will learn how to use the formulae for these calculations and model step by step solutions.
2.	**Volume and surface area of a cone**	• In this lesson, we will learn how to calculate the volume and surface area of a cone. We will model the suitable formulae and work through examples.
3.	**Volume and surface area of a sphere**	• In this lesson, we will calculate the volume and surface area of a sphere. We will explore the formulae for these calculations and model step by step worked examples.
4.	**Volume and surface area of composite solids**	• In this lesson, we will calculate the volume and surface area of composite solids. We will deconstruct these shapes to help identify what formulae to use to work out the total volume and surface area.

Unit 37 Advanced Trigonometry 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use the cosine rule to find a missing length**	• In this lesson, we will learn to substitute into the cosine rule to find a missing length in a non right angled triangle
2.	**Use the cosine rule to find a missing angle**	• In this lesson, we will learn how to substitute into the cosine rule to find a missing angle in a non right angled triangle
3.	**Use the sine rule to find a missing angle**	• In this lesson, we will learn to substitute into the sine rule to find a missing angle in a non right angled triangle
4.	**Use the sine rule to find a missing length**	• In this lesson, we will learn to substitute into the sine rule to find a missing length in a non right angled triangle

Unit 38 Advanced Trigonometry 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**When to Use the Sine or Cosine Rules**	• In this lesson, we will develop the skill of knowing when to apply the sine and cosine rules. We will be able to identify cases that do and do not allow us to use the sine and cosine rules.
2.	**Sine, Cosine and Area Rules - Mixed Problems**	• In this lesson, we will apply the sine and cosine rules as well as the formula A = Â½ absinC in order to solve trigonometry problems.
3.	**Use A = Â½ absinC to Find a Missing Length**	• In this lesson, we will learn how to use the formula A = Â½ absinC to find a missing length by rearranging the formula.
4.	**Area of a Triangle Using A = Â½ absinC**	• In this lesson, we will learn how to find the area of a triangle using the formula A = Â½ absinC.

Unit 39 Advanced Trigonometry 3

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Trigonometry in 3D shapes**	• In this lesson, we will learn how to apply trigonometry to solve problems involving missing lengths in 3D shapes such as cuboids and tetrahedrons. .
2.	**Solve trig equations involving sin x between 0 and 360**	• In this lesson, we will learn how to solve trigonometric equations involving sin(x) between 0 and 360 degrees. We will investigate and interpret the plot of the function y = sin(x).
3.	**Solve trig equations involving cos x between 0 and 360**	• In this lesson, we will learn how to solve trigonometric equations involving cos(x) between 0 and 360 degrees. We will investigate and interpret the plot of the function y = cos(x).
4.	**Sine Rule Ambiguous Case**	• In this lesson, we will learn about the ambiguous case when applying the sine rule. There are circumstances whereby our equation will produce two answers. Here we discuss how to interpret them correctly.

Unit 40 Circle Theorems 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Circle Theorems: Angles in a cyclic quadrilateral**	• In this lesson, we will learn that opposite angles in a cyclic quadrilateral sum to 180 degrees. We will prove this result with a general case.
2.	**Circle Theorems: Angles in the same segment**	• In this lesson, we will learn that angles in the same segment are equal when subtended from the same chord. We will prove this result with a general case.
3.	**Circle Theorems: Angle in a semicircle is 90 degrees**	• In this lesson, we will learn that the angle in a semicircle is 90 degrees when the angle is subtended from the diameter. We will prove this result with a general case.
4.	**Circle Theorems: Angle at the centre and angle at the circumference**	• In this lesson, we will learn that the angle at the centre of a circle is twice the angle at the circumference when subtended from the same arc. We will prove this result with a general case.

Unit 41 Circle Theorems 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Mixed circle theorem problems**	• In this lesson, we will practise answering different circle theorem problems that will require us to recall knowledge from each of the circle theorems.
2.	**Circle Theorems: The perpendicular from the centre to a chord bisects the chord**	• In this lesson, we will learn that a perpendicular from the centre to a chord bisects the chord. We will prove this result with a general case.
3.	**Circle Theorems: The alternate segment theorem**	• In this lesson, we will learn that an angle made with a chord and tangent is equal to the angle subtended by the chord in the alternate segment. We will prove this result with a general case.
4.	**Circle Theorems: A tangent and radius are perpendicular at the point of contact**	• In this lesson, we will learn that a tangent and radius are perpendicular at the point of contact. We will prove this result with a general case.

Unit 42 Constructions & Loci

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Construct triangles	• In this lesson, we will accurately construct triangles using a protractor and ruler when given angle and length measurements.
2.	Construct a perpendicular bisector	• In this lesson, we will learn how to construct a perpendicular bisector using a compass, ruler, pencil and paper.
3.	Construct a perpendicular bisector from a point to a line	• In this lesson, we will learn how to construct a perpendicular bisector from a point to a line using a compass, ruler, pencil and paper.
4.	Construct an angle bisector	• In this lesson, we will learn how to construct an angle bisector using a compass, ruler, pencil and paper.
5.	Loci around a point	• In this lesson, we will learn how to draw the locus of points around a single point using a compass, ruler, pencil and paper.

6.	**Loci from a line**	• In this lesson, we will learn how to draw the locus of points that are a given distance from a line segment. We will do this using a compass, ruler, pencil and paper.
7.	**Loci from a shape**	• In this lesson, we will learn how to draw the locus of points a given distance from a shape. We will do this using a compass, ruler, pencil and paper.
8.	**Equidistant from two points**	• In this lesson, we will learn how to draw the locus of points equidistant from two given points. We will do this using a compass, ruler, pencil and paper.

Unit 43 Solve equations numerically (Iteration) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solve equations numerically: Rearrange to form iterative formulae**	• In this lesson, we will rearrange equations to form iterative equations
2.	**Solve equations numerically: Change of sign**	• In this lesson, we will use substitution to determine whether a solution to an equation lies between two values.
3.	**Solve equations numerically: Trial and improvement**	• In this lesson, we will use trial and improvement to find approximate solutions to algebraic equations.
4.	**Solve equations numerically: Solving equations using iteration**	• In this lesson, we will use iteration to find approximate solutions.

Unit 44 Direct and Inverse Proportion

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Other direct proportion relationships**	• In this lesson, we will learn about non-linear proportional relationships using the formula y=kx^2
2.	**Simple direct proportion y = kx**	• In this lesson, we will use the formula y=kx to describe directly proportional relationships.
3.	**Further proportionality**	• In this lesson, we will look at examples of proportion where we have three variables involved.
4.	**Inverse proportion**	• In this lesson, we will look at inversely proportional relationships and derive and apply formulae related to them.

Unit 45 Functions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find a particular value of f(x)**	• In this lesson, we will use substitution skills and knowledge of order of operations to find a particular value of f(x)
2.	**Solve equations using f(x) =**	• In this lesson, we will use knowledge of using inverse functions to solve equations using f(x)
3.	**Composite functions**	• In this lesson, we will apply more than one function to a number or a variable using substitution, knowledge of expanding brackets and also apply these skills to solving equations such as fg(x) = h(x)
4.	**Find inverse functions**	• In this lesson, we will use knowledge of using inverse functions (function machines) and making x the subject to find inverse functions.

Unit 46 Further Algebraic Fractions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Write the difference of two algebraic fractions where the denominator is an expression**	• In this lesson, we will learn how to calculate the subtraction of two algebraic fractions in cases where the denominator of at least one fraction is algebraic.
2.	**Solve algebraic fraction equations**	• In this lesson, we will learn how to solve equations where one side is an integer, and the other is an algebraic fraction with an algebraic denominator.
3.	**Solve algebraic fraction equations involving addition or subtraction**	• In this lesson, we will learn how to solve equations where one side is an integer, and the other requires the addition or subtraction of two algebraic fractions.
4.	**Write the sum of two algebraic fractions where the denominator is an expression**	• In this lesson, we will learn how to calculate the sum of two algebraic fractions in cases where the denominator of at least one fraction is algebraic.

Unit 47 Algebraic Proof

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Odd and even number proofs**	• In this lesson, we will learn about algebraic proofs that involve algebraic representations of odd and even numbers.
2.	**Consecutive number proofs**	• In this lesson, we will learn about algebraic proofs that involve algebraic representations of consecutive numbers.
3.	**Prove an expression will be a multiple of a given number**	• In this lesson, we will learn how to prove that an algebraic expression can represent all multiples of a particular number.
4.	**Prove by counter example**	• In this lesson, we will learn how to disprove a statement by providing a counter example.

Unit 48 Circle Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Decide whether a point lies, on, outside or inside a circle**	• In this lesson, we will use substitution to decide whether a point lies outside or inside a circle.
2.	**Find the equation of a tangent to a circle at a given point**	• In this lesson, we will earn how to find the equation of a tangent to a circle at a given point.
3.	**Intersection of lines and circles**	• In this lesson will will investigate the intersection of a line and a circle.
4.	**Draw and recognise circle graphs of the form xÂ^2 + yÂ^2 = rÂ^2**	• In this lesson, we will learn how to draw and recognise circle graphs of the form xÂ^2 + yÂ^2 = rÂ^2 where r is the radius of the circle.

Unit 49 Probability 3 (Tree diagrams)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw a tree diagram for independent events**	• In this lesson, we will learn how to draw tree diagrams and complete missing probabilities in tree diagrams for independent events.
2.	**Calculate probabilities of independent events**	• In this lesson, we will learn how to calculate probabilities of outcomes for independent events from tree diagrams
3.	**Draw a tree diagram for dependent events**	• In this lesson, we will learn how to draw tree diagrams and complete missing probabilities in tree diagrams for dependent events.
4.	**Calculate probabilities of dependent events**	• In this lesson, we will learn how to calculate probabilities of outcomes for dependent events from tree diagrams

Unit 50 Histograms

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the median from a histogram**	• In this lesson, we will learn how to use a histogram to estimate the median, quartiles or frequencies using parts of bars
2.	**Find probabilities from a histogram**	• In this lesson, we will learn how to find probabilities from a histogram by finding the frequencies represented by each bar and the vertical scale.
3.	**Plot a histogram**	• In this lesson, we will learn how to find frequency density for grouped frequency distributions with unequal class intervals and use them to plot a histogram
4.	**Find frequency from a histogram**	• In this lesson, we will learn how to complete a frequency table from a histogram, use a histogram and a known frequency to find the scale on the vertical axis and subsequently all the other frequencies.

Unit 51 Data Collection Higher

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Design questionnaires avoiding bias	• In this lesson, we will learn how to identify poor practice in questionnaires such as bias in poorly written questions, incomplete response boxes, leading questions or a limited sample.
2.	Sampling methods	• In this lesson, we will learn to recognise different types of sampling and identify the most appropriate method to use for a particular situation.
3.	Stratified sampling	• In this lesson, we will learn to understand and interpret stratified sampling and calculate sample sizes of strata
4.	Capture-recapture	• In this lesson, we will learn to understand and interpret how a population can be estimated using the capture-recapture method.

Unit 52 Revise - Linear and Quadratic Graphs

12 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the gradient of a line**	• In this lesson, we will revise the term 'gradient' and learn how to identify and calculate the gradient of a plotted line using two pairs of coordinates. We will compare lines with different gradients.
2.	**Find the equation of a straight line using y=mx+c**	• In this lesson, we will find the equation of a straight line using y=mx+c. We will use coordinates taken from a plotted straight line to help us calculate the gradient, then use a method of substitution to find the equation of the line.
3.	**Using gradient to solve problems with parallel lines**	• In this lesson, we will use the gradient of a line to solve problems with parallel lines. We will investigate the relationship between different linear graphs with the same gradient.
4.	**Plot simple quadratic equations**	• In this lesson, we will plot graphs of simple quadratic equations and recognise some of their properties. We will determine the general features of quadratic graphs.

5.	**Solving Quadratic Equations Graphically**	• In this lesson, we will interpret graphs of quadratic equations in order to find their solutions. We will investigate the key features of quadratic graphs that help us identify their solutions.
6.	**Find the intercept and gradient from a line given in any form**	• In this lesson, we will investigate different strategies to find the intercept and gradient for a linear graph. Each method will utilise the equation of the line.
7.	**Identify and interpret roots, intercepts and turning points of quadratic graphs**	• In this lesson, we will recognise the roots, y-intercept and turning points on a graph of a quadratic function. We will define these key terms and investigate quadratic curves to help label them with this new vocabulary.
8.	**Plot other quadratic equations**	• In this lesson, we will plot graphs of quadratic equations of the form axÂ^2 + bx + c and recognise some of their properties. We will investgate how different coefficients alter the appearance of the quadratic curve.
9.	**Solving quadratic equations, given a different quadratic, using a sketch**	• In this lesson, we will learn how to solve quadratic equations, given a different quadratic, using a sketch.

10.	**Draw quadratic graphs (a > 1)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of xÂ^2 is greater than 1
11.	**Draw quadratic graphs (negative x squared)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of xÂ^2 is negative.
12.	**Solve quadratic graphs = 0, = a and = ax + b**	• In this lessons we will learn how to use graphs to find solutions to equations where one is quadratic and one is linear.

Unit 53 Cubic and Reciprocal Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw graphs of simple cubic functions using a table of values.**	• In this lesson, we will learn how to draw graphs of simple cubic functions using a table of values.
2.	**Sketch graphs of simple cubic functions, given as three linear expressions.**	• In this lesson, we will sketch graphs of simple cubic functions, given as three linear expressions. We will calculate a set of coordinates and sketch the cubic function from these.
3.	**Interpret graphs of simple cubic functions, including finding solutions to cubic equations**	• In this lesson, we will interpret graphs of simple cubic functions, including finding estimated solutions to cubic equations.
4.	**Recognise, draw, sketch and interpret graphs of the reciprocal function y = 1/x**	• In this lesson, we will recognise, draw, sketch and interpret graphs of the function y = 1/x. We will investigate the pattern of behaviours of general graphs of the form a/x.

Unit 54 Other Graphs (Trig, Exponetial and Transformations)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Recognise, Sketch and Interpret Graphs of Exponential Functions (ð■‘¦=ð■‘˜^ð■‘¥)**	• In this lesson, we will learn how to recognise, sketch and interpret graphs of exponential functions (ð■‘¦=ð■‘˜^ð■‘¥).
2.	**Transformation of graphs (translations)**	• In this lesson, we will learn about translations of graphs. We will specifically look at translations of quadratic and exponential functions.
3.	**Transformation of graphs (reflections)**	• In this lesson, we will learn about reflections of graphs. We will practise reflection of quadratic curves.
4.	**Know the Graphs of ð■‘¦=sinâ■¡(ð■‘¥), ð■‘¦=cosâ■¡(ð■‘¥) and ð■‘¦=tanâ■¡(ð■‘¥)**	• In this lesson, we will learn how to identify and sketch the graphs of ð■‘¦=sinâ■¡(ð■‘¥), ð■‘¦=cosâ■¡(ð■‘¥) and ð■‘¦=tanâ■¡(ð■‘¥).

Unit 55 Further graphs (Gradients/Area of curves)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Estimate the gradient of a curve**	• In this lesson, we will estimate the gradient of a curve by drawing a tangent to it. We will learn how to draw tangents to curves.
2.	**Find the area under a straight line**	• In this lesson, we will find the area under a straight line by forming quadrilaterals from the x axis.
3.	**Estimate the area under a curve**	• In this lesson, we will estimate the area under a curve by forming trapeziums from the x axis.
4.	**Estimate and interpret the gradient of a curve**	• In this lesson, we will estimate and interpret a gradient for a given curve using triangles.

Unit 56 Graphs of Inequalities

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Represent inequalities on a coordinate grid 1**	• In this lesson, we will learn how to represent inequalities of the form y > a on a coordinate grid.
2.	**Represent inequalities on a coordinate grid 2**	• In this lesson, we will learn how to represent inequalities of the form y > ax + b on a coordinate grid.
3.	**Shade in the region defined by several inequalities**	• In this lesson, we will learn how to shade a region on a coordinate grid that satisfies two or more inequalities.
4.	**Identify inequalities that make up a shaded region**	• In this lesson, we will learn how to identify inequalities that make up more complex shaded regions.

Unit 57 Compound measures

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use and apply the speed formula**	• In this lesson, we will perform calculations involving speed, distance and time and learn about the units involved.
2.	**Use and apply the density formula**	• In this lesson, we will perform calculations involving mass, density and volume and learn about the units involved.
3.	**Use and apply the pressure formula**	• In this lesson, we will perform calculations involving pressure, force and area and learn about the units involved.
4.	**Solve simple kinematics problems (velocity, initial velocity and acceleration formulae)**	• In this lesson, we will begin to learn about Kinematics, substitute into the SUVAT equations and apply the SUVAT equations to problems.

Unit 58 Volume and Surface Area Higher 3

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Surface Area: Further problem solving	• In this lesson, we will further our problem solving with surface area of spheres, cones and pyramids. In these more complicated examples we will, for example, deduce measures of length when provided with the surface area.
2.	Volume: Further problem solving with spheres, cones and pyramids	• In this lesson, we will further our problem solving with volume of spheres, cones and pyramids which also uses Pythagoras' Theorem to find missing lengths.
3.	Surface area and volume of a hemisphere	• In this lesson, we will learn how to find the surface area and volume of a hemisphere.
4.	Find the volume of a frustum	• In this lesson, we will learn how to find the volume of a frustum. We will model the formulae required, and investigate the frustum of a cone and a square based pyramid.

Unit 59 Translate and Vectors 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Translate and describe an object given a horizontal or vertical instruction**	• In this lesson, we will translate images in horizontal and vertical directions on a squared grid given worded instructions.
2.	**Represent a column vector as a diagram and using notation**	• In this lesson, we will investigate column vectors and their representative diagrams.
3.	**Write a column vector from a diagram**	• In this lesson, we will accurately determine a column vector from a given diagram.
4.	**Translate and describe a 2D vector**	• In this lesson, we will understand the meaning of a 2D vector, and use them to translate objects and describe translations.

Unit 60 Vectors 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Add two column vectors (including diagrams) to give a resultant vector**	• In this lesson, we will learn how to perform addition using column vectors. We will investigate this process using diagrams.
2.	**Add and subtract two column vectors to give a resultant vector (Part 1)**	• In this lesson, we will practise adding and subtracting column vectors. We will investigate this process using diagrams.
3.	**Multiply a vector by a scalar**	• In this lesson, we will multiply a vector by a given scalar. We will explore this process and make sense of it with suitable diagrams.
4.	**Add and subtract two column vectors to give a resultant vector (Part 2)**	• In this lesson, we will add and subtract column vectors. We will model more complicated examples that use multiples of vectors. We will interpret our answers using suitable diagrams.

Unit 61 Higher Vectors 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Vector diagrams involving ratios**	• In this lesson, we will work with vector diagrams involving length ratios. We will deduce lengths in terms of existing vectors, based upon ratios of proportion between different vectors.
2.	**Simple vector diagrams**	• In this lesson, we will work with simple vector diagrams. We will create new vectors given a set of criteria, by combining existing vectors using addition and subtraction.
3.	**Find the length of a column vector**	• In this lesson, we will find the length of a given column vector using Pythagoras' Theorem.
4.	**Vector diagrams involving midpoints**	• In this lesson, we will work with vector diagrams involving midpoints. We will create new vectors given a set of criteria by combining existing vectors using addition, subtraction, division and multiplication.

Unit 62 Higher Vectors 2 and Congruent Triangles

3 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Prove that two vectors are parallel**	• In this lesson, we will learn how to prove that two vectors are parallel.
2.	**Conditions of congruent triangles**	• In this lesson, we will learn about the conditions under which we can say that two triangles are congruent.
3.	**Prove triangles are congruent**	• In this lesson, we will learn how to prove that two triangles are congruent. We will investigate four different conditions involving observation and comparison of the angles and sides of each triangle. If any condition is met, we can determine that the triangles are congruent.

Unit 63 Enlargement and Similarity

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find volumes of similar shapes given corresponding lengths**	• In this lesson, we will use the linear scale factor to calculate the volume scale factor and find the volume of similar shapes.
2.	**Find areas of similar shapes given corresponding lengths**	• In this lesson, we will use the linear scale factor to calculate the area scale factor and find areas of similar shapes.
3.	**Describe an enlargement with a negative scale factor**	• In this lesson, we will learn how to describe enlargements with a negative scale factor.
4.	**Enlargement with a negative scale factor**	• In this lesson, we will learn how to enlarge a shape using a negative scale factor.

4. Learn More

Learn more contents

These are the different sections that you will find in the learn more section of the Key Stage 4 maths long curriculum plan:

Section number	Section content
1.	Key stage 4 maths introduction
2.	Coherence and flexibility
3.	Knowledge organisation
4.	Knowledge selection
5.	Inclusive and ambitious
6.	Pupil engagement
7.	Motivation through learning

1. Key Stage 4 Maths Introduction

As mathematics teachers we want our pupils to reach fluency in what we are teaching them. In mathematics, fluency requires a deep understanding of concepts and the ability to apply them flexibly and with automaticity. The mathematics curriculum uses multiple representations to help make connections across concepts to help build a deep conceptual understanding. By making consistent use of the same core representations we will scaffold pupils' thinking to help them understand abstract mathematical concepts. The curriculum will also include intelligent practice that is designed to help pupils develop automaticity in their mathematics.

We also aim for our pupils to be able to use the precise language of mathematics, as distinct from everyday language. The curriculum will do this by explicitly teaching mathematical vocabulary and introducing core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

Finally, we also aim for our pupils to be able to think mathematically. The tasks and activities used in the curriculum teach pupils the components of mathematical thinking: to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

Below are the set of principles we have used to build this curriculum, with these ambitions for our pupils in mind.

2. Coherence and flexibility

We strive to support schools by offering a maths curriculum that can fit alongside a range of existing structures. However, complete flexibility over unit ordering is impossible due to the cumulative nature of mathematics and the importance of prior knowledge.

We have grouped lessons into units: coherent sequences of 5 or more lessons. Although each lesson can be accessed individually, explicit connections are made to earlier lessons and later lessons in the same unit. This is because the connections between mathematical concepts are so vital to deepening understanding.

3. Knowledge organisation

The units in the maths curriculum have been organised by strand. We have also created a set of sequences for pupils targeting different grades at GCSE and who are at different stages in KS4, organised based on the topics that are most useful for the GCSE course.

4. Knowledge selection

Our mathematics lessons cover the full scope of the National Curriculum. We have given more time (both in number of lessons and number of units) to those concepts within the National Curriculum that the evidence tells us are foundational to success in maths.

5. Inclusive and ambitious

We know the difference it makes when children believe they “can do” maths. We are guided by the principles of the National Curriculum to ensure that every pupil, regardless of starting point, develops their fluency, reasoning and problem solving. Our activities are scaffolded so all children can succeed. Pupils are offered frequent opportunities to be and feel successful in their maths education.

We develop conceptual understanding by always building new understanding on what pupils already know, by representing concepts in different ways, and by making connections between concepts. The mathematics curriculum makes consistent use of the same core representations across year groups to help pupils connect prior learning to new learning. These representations are selected to make key mathematical structures and ideas accessible to all pupils, no matter what their starting points.

To support every child to communicate mathematically, pupils are introduced to core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

6. Pupil engagement

You learn maths by thinking about maths. Our lessons include mathematical tasks which have multiple solutions. Mathematical thinking is woven into the units using scaffolds and prompts such as ‘what is the same and what’s different?’, ‘is it sometimes, always or never true?’ and ‘which could be the odd one out?’. Throughout the curriculum, all pupils have opportunities to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

7. Motivation through learning

We believe that mathematics is inherently interesting and that all children are entitled to a genuine experience of mathematics. The tasks and activities that pupils engage with harness innate ways of thinking and develop the habits of mind that are drawn upon when being mathematical. Problem solving is at the heart of every lesson with opportunities to investigate, explore and reason.

Maths
Key Stage 4 - Foundation

Curriculum document

OAK
NATIONAL
ACADEMY

1. Philosophy

Six underlying attributes at the heart of Oak's curriculum and lessons.

Knowledge and vocabulary is explicity taught across units and lessons so that pupils build on what they already know to develop powerful knowledge.

Knowledge is **sequenced** and mapped coherently so that pupils make meaningful connections

Curriculum **flexibility** enables schools to tailor their use of Oak to their curricula and context.

Addresses the needs of all learners through adherence to **accessibility** guidelines and requirements.

Rigorous application of the science of learning and best practise ensures learning is **informed by evidence**.

Commitment to **diversity** in our teaching, out teachers and in the language, texts and media we use so that all pupils feel positively represented.

2. Units

KS4 Maths is formed of 63 units and this is the recommended sequence:

Unit Title	Recommended year group	Number of lessons
1 Directed Numbers	Year 10	4
2 4 Rules of Number	Year 10	4
3 Types of numbers	Year 10	4
4 Rules of indices (numbers)	Year 10	4
5 Collecting like terms, simplifying	Year 10	4
6 Expand and simplify brackets	Year 10	4
7 Rules of Indices	Year 10	4
8 Solving equations 1 (One step, Two Step and Brackets)	Year 10	4
9 Solving equations 2 (Simple algebraic fractions)	Year 10	4

10	Substitution and Rearranging formulae	Year 10	4
11	Reflection	Year 10	4
12	Rotation and Enlargement	Year 10	4
13	Pythagoras Theorem 1	Year 10	4
14	Pythagoras Theorem 2	Year 10	4
15	Factors Multiple and Primes	Year 10	4
16	Venn Diagrams	Year 10	4
17	HCF and LCM	Year 10	4
18	Rounding and Estimating	Year 10	4
19	Factorising (single bracket)	Year 10	4
20	Factorise and solve a quadratic (a=1)	Year 10	4
21	Solve Inequalities and Represent on Number Line	Year 10	4

22 Linear Sequences	Year 10	4
23 Fraction equivalents	Year 10	4
24 Fractions 1 (adding and subtracting)	Year 10	4
25 Fractions 2 (multiplying and dividing)	Year 10	4
26 Fraction Change	Year 10	4
27 Simple Graphs	Year 10	4
28 Straight Line Graphs (y=mx+C)	Year 10	4
29 Quadratic Graphs 1 (a=1)	Year 10, Year 11	4
30 Percentages	Year 10	4
31 Percentage increase and decrease	Year 10	4
32 Repeated Percentage Change	Year 10	4
33 FDP Equivalents	Year 10	4

34 Decimals	Year 10	4
35 Ratio 1	Year 10	4
36 Area and Perimeter	Year 10	4
37 Circles	Year 10	4
38 Parts of circles 1 (Semi and quarter circles)	Year 10	4
39 Volume and Surface Area 1 (Prisms)	Year 10	4
40 Angle Facts	Year 11	4
41 Parallel Lines and Polygons 1	Year 11	4
42 Polygons 2 (Interior and Exterior)	Year 11	4
43 Standard Form (Writing and converting)	Year 11	4
44 Standard Form 4 Operations	Year 11	4
45 Ratio 2 (Ratio and Fractions/Direct Proportion/Best Buy)	Year 11	4

46	Revise - Solving Equations	Year 11	8
47	Simultaneous Equations (Linear)	Year 11	4
48	Frequency charts (Data Collection, Bar and Pictograms)	Year 11	4
49	Averages (From a list and tables, Stem and Leaf)	Year 11	4
50	Charts and Tables (Pie Chart and Two way tables)	Year 11	4
51	Scatter diagrams and Frequency trees	Year 11	4
52	Probability 1 (Scale and equally likely events)	Year 11	4
53	Probability 2 (Sample space, Venn diagrams and experimental)	Year 11	4
54	Probability 3 (Tree diagrams)	Year 11	4
55	Straight Line Graphs 2 (Parallel Lines)	Year 11	4
56	Travel Graphs	Year 11	4
57	Compound measures	Year 11	4

58	Translate and Vectors 1	Year 11	4
59	Vectors 2	Year 11	4
60	Bearings	Year 11	4
61	Views and Maps	Year 11	4
62	Constructions	Year 11	4
63	Loci	Year 11	4

3. Lessons

Unit 1 Directed Numbers

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Adding directed numbers	• In this lesson, we will recap adding directed (+ -) numbers using visual representations such as double sided counters to aid understanding.
2.	Subtract directed numbers	• In this lesson, we will recap subtracting directed (+ -) numbers using visual representations such as double sided counters to aid understanding.
3.	Multiply and divide directed numbers	• In this lesson, we will recap multiplying and dividing directed numbers using visual representations such as double sided counters to aid understanding.
4.	Order of Operations	• In this lesson, we will recap using the Order of Operations with directed numbers.

Unit 2 4 Rules of Number

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Adding and subtracting two integers**	• In this lesson, we will revisit how to add and subtract large integers using the column method.
2.	**Multiplying two integers**	• In this lesson, we will revisit how to multiply any two integers using the column method.
3.	**Dividing two integers**	• In this lesson, we will revisit how to divide any two integers using the bus stop method.
4.	**Four operations**	• In this lesson, we will revisit a variety of problems that involve using the four operations. We will model solutions using the column method and the bus stop method.

Unit 3 Types of numbers

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Square and cube numbers	• In this lesson, we will investigate the properties of square and cube numbers. We will model what these number categories are using visual models of arrays and stacked cubes, and will pracise calculating squaring and cubing a number.
2.	Square roots and cube roots	• In this lesson, we will investigate the properties of square and cube roots. We will look at common terminology, symbols, and how to calculate and interpret square and cube roots of integers.
3.	Higher powers	• In this lesson, we will learn about using indices greater than 3. We will make sense of numbers written with an index greater than 3, and learn how to calculate the value of those numbers.

4. **Higher roots**

- In this lesson, we will investigate higher roots of numbers. This is an extension of square and cube roots. We will make sense of numbers written with higher roots, and learn how to calculate the value of those numbers.

Unit 4 Rules of indices (numbers)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Multiply powers	• In this lesson we will learn how to apply and obey index laws when multiplying numbers with powers.
2.	Divide powers	• In this lesson we will learn how to apply and obey index laws when dividing numbers with powers.
3.	Powers of powers	• In this lesson we will learn how to apply index laws when raising numbers with powers to another power.
4.	Manipulating powers	• In this lesson, we will learn how to manipulate powers to change bases. We will learn how to identify when this is and is not possible.

Unit 5 Collecting like terms, simplifying

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Simplify Expressions by Collecting Like Terms**	• In this lesson, we will introduce the vocabulary 'like terms' and group numbers and algebraic terms together in expressions to make them simpler.
2.	**Simplify Expressions by Multiplying Terms**	• In this lesson, we will simplify the appearance of an expression that uses multiplication of algebraic terms. We will also investigate how we can multiply two algebraic terms.
3.	**Expand a Term over a Single Bracket including Powers**	• In this lesson, we will rewrite an expression by multiplying out brackets that involve algebraic terms. We will look at cases where we are multiplying two algebraic terms together, requiring the use of indices. We will also look at generating algebraic expressions using area models.
4.	**Expand a Term over a Single Bracket**	• In this lesson, we will rewrite an expression by multiplying out brackets that involve algebraic terms. We will also look at generating algebraic expressions using area models.

Unit 6 Expand and simplify brackets

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Expand 2 brackets and simplify expressions (Part 1)**	• In this lesson, we will expand 2 brackets using algebra tiles and/or a grid e.g. where nâ‰¥1 4(nxÂ±5)+6(nxÂ±3)
2.	**Expand 2 brackets and simplify expressions (Part 2)**	• In this lesson, we will expand 2 brackets using algebra tiles and/or a grid e.g. where nâ‰¥1 4(nxÂ±5)-6(nxÂ±3)
3.	**Expand and simplify double brackets**	• In this lesson, we will expand and simplify double brackets using a grid or other method e.g. (ð‘¥+ 2)(ð‘¥ + 3)
4.	**Expand and Simplify Double Brackets (Coefficient of ð‘¥ Greater than 1)**	• In this lesson, we will expand and simplify double brackets. We will look at specific cases where the coefficient of ð‘¥ is greater than 1.

Unit 7 Rules of Indices

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Multiplication Law for indices	• In this lesson, we will investigate the Multiplication Law for indices. We will derive this law and use it to simplify expressions.
2.	Division Law for indices	• In this lesson, we will investigate the Division Law for indices. We will derive this law and use it to simplify expressions.
3.	Power Law for Indices	• In this lesson, we will investigate the Power Law for indices. We will derive this law and use it to simplify expressions.
4.	Combining Index Laws	• In this lesson, we will be applying all three Index Laws to help us simplify more complicated expressions.

Unit 8 Solving equations 1 (One step, Two Step and Brackets) — 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving equations with brackets**	• In this lesson, we will solve equations with brackets including those that first need to be formed from a word problem.
2.	**Solving equations with unknown on both sides**	• In this lesson, we will solve equations with an unknown on both sides including those that first need to be formed from a word problem.
3.	**Solving one-step equations**	• In this lesson, we will solve one step equations including those that first need to be formed from a word problem.
4.	**Solving two-step equations**	• In this lesson, we will solve two step equations including those that first need to be formed from a word problem.

Unit 9 Solving equations 2 (Simple algebraic fractions)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Solving algebraic fractions (one fraction equal to another)	• In this lesson, we will be solving algebraic fractions where one fraction is equal to another fraction.
2.	Solve simple algebraic fractions (equal to a number)	• In this lesson, we will solve equations with algebraic fractions equal to a number.
3.	Solve equations that first involve simplification 2 (x + 3) + 5x = 15	• In this lesson, we will solve equations that first need some type of simplification.
4.	Solving algebraic fractions (equal to x + a)	• In this lesson, we will solve equations with an algebraic fraction equal to a number and an unknown value.

Unit 10 Substitution and Rearranging formulae

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Change the subject of a formula**	• In this lesson, we will change the subject of a formula in which the term appears once.
2.	**Change the subject of a formula with squares and square roots**	• In this lesson, we will change the subject of a formula where the formula involves squares and square roots and the term only appears once.
3.	**Substitute a positive term into a formula**	• In this lesson, we will be substituting positive values into a variety of formulae and calculating the result.
4.	**Substitute a negative term into a formula**	• In this lesson, we will be substituting negative values into a variety of formulae, and calculating the result.

Unit 11 Reflection

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Reflecting in a given horizontal or vertical line (Part 1)**	• In this lesson, we will reflect shapes in horizontal or vertical lines on a grid. We will explore the terminology of transformations and practise reflecting shapes across a line.
2.	**Reflecting in a given horizontal or vertical line (Part 2)**	• In this lesson, we will reflect shapes across horizontal or vertical lines on a coordinate grid. We will extend our knowledge of reflections by using mathematical vocabulary to describe reflections in the coordinate plane.
3.	**Reflecting in a given diagonal line (Part 1)**	• In this lesson, we will reflect shapes on a square grid using a diagonal line of reflection rather than a horizontal or vertical line.
4.	**Reflecting in a given diagonal line (Part 2)**	• In this lesson, we will reflect shapes across mirror lines with a gradient of 1 on a coordinate grid. We will also describe reflections using mathematical vocabulary.

Unit 12 Rotation and Enlargement

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Rotate an Object around a Given Point**	• In this lesson, we will rotate any object around a given centre of rotation.
2.	**Rotate an Object around a Given Coordinate**	• In this lesson, we will rotate any object around a given centre of rotation, and describe rotations on coordinate grids.
3.	**Enlarge an Object with a Positive Scale Factor**	• In this lesson, we will enlarge objects by a given scale factor, and identify scale factors.
4.	**Enlarge an Object with a Positive Scale Factor from a Given Coordinate**	• In this lesson, we will enlarge objects by a given scale factor, and describe enlargements on coordinate grids.

Unit 13 Pythagoras Theorem 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Know and Understand Pythagoras' theorem	• In this lesson, Pythagoras' Theorem will be introduced. We will learn what the theorem is, and practise skills we will use to calculate missing sides such as squaring and finding the square root of a number.
2.	Find the length of the shorter side	• In this lesson, Pythagoras' Theorem will be applied to find a shorter side of a right-angled triangle.
3.	Mixture of Finding a Missing Length	• In this lesson, we will apply Pythagoras' Theorem to find any missing length of a right-angled triangle.
4.	Find the length of the hypotenuse	• In this lesson, Pythagoras' Theorem will be applied to find the hypotenuse of a right-angled triangle.

Unit 14 Pythagoras Theorem 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use Pythagoras' theorem to show that a triangle is right-angled**	• In this lesson, we will apply Pythagoras' Theorem to determine if a triangle is right-angled. This is known as the converse of Pythagoras' Theorem.
2.	**Use Pythagoras' Theorem to find the length of a line segment**	• In this lesson, we will use Pythagoras' Theorem to find the length of a line segment that joins two pairs of coordinates
3.	**Use Pythagoras' Theorem with Isosceles Triangles**	• In this lesson, we will learn how to apply Pythagoras' Theorem to isosceles triangles to find missing side lengths or angles.
4.	**Apply Pythagoras' Theorem to two triangles**	• In this lesson, we will apply Pythagoras' Theorem to two triangles that share a common side.

Unit 15 Factors Multiple and Primes

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Identify Prime Numbers**	• In this lesson, we will recap identifying prime numbers. We will define prime numbers and explain their properties.
2.	**Using Prime Factor Decomposition**	• In this lesson, we will investigate how we can manipulate numbers when they are written as a product of their prime factors. We will learn how to idenitfy various properties of numbers by interrogating them as a product of prime factors.
3.	**Multiples and Factor Pairs**	• In this lesson, we will recap the fundamental concepts of multiples and factors of a single number. We will explore the concepts using bar models and dot arrays.
4.	**Prime Factor Decomposition**	• In this lesson, we will revisit the concept of using factor trees to rewrite a number as a product of its prime factors.

Unit 16 Venn Diagrams

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Understand Venn diagrams, sort data and label**	• In this lesson, we will learn about the universal set and members of a set. We will interpret different representations (2 circles only) of a Venn diagram for given listed information, including sorting and labelling data
2.	**Find and understand the intersection of 2 sets**	• In this lesson, we will learn how to find the intersection of two sets of data and use the correct set notation (2 circles only). We will learn how to sort information into a Venn diagram, where calculations are involved.
3.	**Complement of a set**	• In this lesson, we will learn what the complement of a set is and use the correct set notation. We will practise finding the compliment of a set.
4.	**Find and understand the union of 2 sets**	• In this lesson, we will learn how to find the union of two sets and use the correct set notation, recapping intersection and looking at Venn diagrams with more than 2 circles

Unit 17 HCF and LCM

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Simple LCM and HCF	• In this lesson, we will learn about the terms 'Lowest Common Multiple' and 'Highest Common Factor'. We will learn how to determine lowest common multiples for small integers by listing and comparing their factors and multiples.
2.	Finding the LCM	• In this lesson, we will find the 'Lowest Common Multiple' of two integers using a Venn diagram to compare their prime factors.
3.	Finding the HCF	• In this lesson, we will find the 'Highest Common Factor' of two integers by comparing their prime factors using a Venn diagram.
4.	Applying LCM and HCF	• In this lesson, we will answer problem solving questions involving determining the lowest common multiple and highest common factor of two integers. We will model solutions to a range of problems including worded questions.

Unit 18 Rounding and Estimating

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Round to two decimal places	• In this lesson, we will learn how to round numbers to two decimal places using place value and number lines.
2.	Round up to three significant figures	• In this lesson, we will learn how to round numbers to 1, 2 or 3 significant figures
3.	Limits of accuracy	• In this lesson, we will learn how to find the upper and lower bounds of a rounded value and use this information in simple calculations
4.	Estimating answers	• In this lesson, we will learn how to estimate the answer to a calculation by rounding all the values to one significant figure before calculating.

Unit 19 Factorising (single bracket)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Factorising Single Brackets: Factor out a letter**	• In this lesson, we will learn how to identify whether we can take an algebraic expression and factorise it using a pair of brackets and our knowledge of common factors.
2.	**Factorise Single Brackets: Factor a number and a letter**	• In this lesson, we will learn how to identify whether we can take an algebraic expression and factorise it using a pair of brackets and our knowledge of common factors. The examples will include common factors where algebraic coefficients are greater than 1.
3.	**Factorising single brackets (more complicated expressions)**	• In this lesson, we will learn about how to factorise more complex expressions in to single brackets.
4.	**Factorising Single Brackets**	• In this lesson, we will learn how to identify whether we can take an expression and factorise it using a pair of brackets and our knowledge of common factors.

Unit 20 Factorise and solve a quadratic (a=1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Factorise a quadratic	• In this lesson, we will learn how to factorise a quadratic expression into two brackets
2.	Factorise a quadratic (difference of two squares)	• In this lesson, we will learn how to factorise a quadratic expression as a difference of two squares
3.	Solve a quadratic equation by factorising	• In this lesson, we will learn how to solve a quadratic equation by factorising the expression to determine what values produce a zero multiplier.
4.	Simplifying an algebraic fraction by factorising	• In this lesson, we will learn how to simplify algebraic fractions by factorising and identifying common factors in both the numerator and denominator.

Unit 21 Solve Inequalities and Represent on Number Line

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Representing Inequalities on a Number Line	• In this lesson, we will learn to represent inequalities on a number line.
2.	Solve One and Two Step Inequalities	• In this lesson, we will learn to solve simple inequalities by using a number line.
3.	Solve Inequalities with Unknowns on Both Sides	• In this lesson, we will learn to solve inequalities with unknowns on both sides.
4.	Solving Inequalities Involving Algebraic Fractions	• In this lesson, we will learn to solve inequalities which include fractions.

Unit 22 Linear Sequences

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Triangular and Fibonacci style sequences**	• In this lesson, we will be learning about triangular and Fibonacci style sequences. We will use arrays to aid visualising how sequences expand.
2.	**Simple quadratic and cubic sequences**	• In this lesson, we will investigate how terms change when a sequence is quadratic. In other words, it is of the form ax^2 + bx + c. We will also investigate cubic sequences.
3.	**Write the nth term of a linear sequence**	• In this lesson, we will investigate what a linear sequence is, and how to calculate an algebraic rule to generate the sequence, referred to as the nth term.
4.	**Find terms of a linear sequence**	• In this lesson, we will investigate how to take an algebraic rule and generate a sequence, or specific terms within a sequence.

Unit 23 Fraction equivalents

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Equivalent Fractions**	• In this lesson, we will calculate equivalent fractions using knowledge of multiples and factors.
2.	**Simplifying Fractions**	• In this lesson, we will learn how to write a fraction in its simplest form using our knowledge of multiples and factors.
3.	**Comparing two fractions**	• In this lesson, we will use our knowledge of equivalent fractions to compare them and organise pairs of fractions in ascending and descending order of size using the 'greater than' and 'less than' symbols.
4.	**Ordering three or more fractions**	• In this lesson, we will use our knowledge of equivalent fractions to compare them and organise groups of fractions in ascending and descending order of size using the 'greater than' and 'less than' symbols.

Unit 24 Fractions 1 (adding and subtracting) — 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Adding and subtracting fractions < 1	• In this lesson, we will learn how to add and subtract proper fractions with different denominators.
2.	Adding mixed numbers	• In this lesson, we will learn how to add mixed numbers to other mixed numbers or fractions with different denominators
3.	Subtracting mixed numbers	• In this lesson, we will learn how to subtract mixed numbers from other mixed numbers or fractions with different denominators
4.	Mixed fraction addition and subtraction problems	• In this lesson, we will learn how to add and/or subtract fractions and/or mixed numbers in problems presented in a non-standard form

Unit 25 Fractions 2 (multiplying and dividing)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Multiplying a fraction by an integer**	• In this lesson, we will multiply a fraction by an integer, including mixed numbers and negative values.
2.	**Multiplying a fraction by a fraction**	• In this lesson, we will multiply a fraction by a fraction, including mixed numbers and negative values.
3.	**Dividing a fraction by an integer**	• In this lesson, we will divide a fraction by an integer, including mixed numbers and negative values.
4.	**Dividing a fraction by a fraction**	• In this lesson, we will divide a fraction by a fraction, including mixed numbers and negative values.

Unit 26 Fraction Change

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Fraction of an amount**	• In this lesson, we will investigate methods to find a fraction of an amount without using a calculator.
2.	**Increasing and decreasing by a fraction of an amount**	• In this lesson, we will find a fraction of an amount. We will use this information to increase or decrease the original quantity by this amount.
3.	**Find the whole when given a fraction of an amount**	• In this lesson, we will learn that given the fraction of an amount, we can find what the original quantity was. We will investigate ways to do this.
4.	**Application of fraction of an amount skills**	• In this lesson, we will investigate a mixture of problems involving finding the fraction of an amount.

Unit 27 Simple Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw and recognise graphs of the form y = kx**	• In this lesson, we will be drawing graphs in the form y=kx. We will identify features of these graphs and learn how to identify these graphs from their visual properties.
2.	**Draw graphs of the form y=mx+c by using a table of values**	• In this lesson, we will be drawing graphs in the form y=mx+c. We will use the equation of the line to determine a set of coordinates using a table of values, which we will then plot.
3.	**Draw graphs of the form ax+by = c by using a table of values**	• In this lesson, we will be drawing graphs in the form ax+by=c through drawing a table of values. We will investigate how we can use our knowledge of number bonds and inspection to help us calculate a table of values more easily.
4.	**Use graphs to solve simple equations including simultaneous equations**	• In this lesson, we will investigate how to solve a pair of simultaneous equations by ploptting them and interpreting the coordinates at the point of intersection.

Unit 28 Straight Line Graphs (y=mx+C)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find the gradient of a line**	• In this lesson, we will revise the term 'gradient' and learn how to identify and calculate the gradient of a plotted line using two pairs of coordinates. We will compare lines with different gradients.
2.	**Find the equation of a straight line using y=mx+c**	• In this lesson, we will find the equation of a straight line using y=mx+c. We will use coordinates taken from a plotted straight line to help us calculate the gradient, then use a method of substitution to find the equation of the line.
3.	**Using gradient to solve problems with parallel lines**	• In this lesson, we will use the gradient of a line to solve problems with parallel lines. We will investigate the relationship between different linear graphs with the same gradient.
4.	**Find the intercept and gradient from a line given in any form**	• In this lesson, we will investigate different strategies to find the intercept and gradient for a linear graph. Each method will utilise the equation of the line.

Unit 29 Quadratic Graphs 1 (a=1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Plot simple quadratic equations**	• In this lesson, we will plot graphs of simple quadratic equations and recognise some of their properties. We will determine the general features of quadratic graphs.
2.	**Solving Quadratic Equations Graphically**	• In this lesson, we will interpret graphs of quadratic equations in order to find their solutions. We will investigate the key features of quadratic graphs that help us identify their solutions.
3.	**Identify and interpret roots, intercepts and turning points of quadratic graphs**	• In this lesson, we will recognise the roots, y-intercept and turning points on a graph of a quadratic function. We will define these key terms and investigate quadratic curves to help label them with this new vocabulary.
4.	**Plot other quadratic equations**	• In this lesson, we will plot graphs of quadratic equations of the form axÂ^2 + bx + c and recognise some of their properties. We will investgate how different coefficients alter the appearance of the quadratic curve.

Unit 30 Percentages

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Simple percentages without a calculator**	• In this lesson, we will learn how to calculate simple percentages of an amount without a calculator
2.	**Fractions greater than 1 and percentages above 100%**	• In this lesson, we will find fractions greater than 1 of an amount and percentages above 100% of an amount
3.	**Express one number as a fraction or percentage of another without a calculator**	• In this lesson, we will learn how to write one quantity as a fraction or percentage of another
4.	**Decimal multiplier method to find percentages of an amount**	• In this lesson, we will determine and use a decimal multiplier to find the percentage of an amount

Unit 31 Percentage increase and decrease

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Calculate Percentage Change**	• In this lesson, we will learn about how to determine the proportional percentage increase or decrease between two values
2.	**Increase and Decrease an Amount by a Percentage**	• In this lesson, we will learn about increasing or decreasing an amount by a percentage determining and using a decimal multiplier.
3.	**Reverse Percentages**	• In this lesson, we will learn how to calculate reverse percentages. We will learn how to take a given quantity as a percentage of a whole, and use it to calculate the value of the whole.
4.	**Simple Interest**	• In this lesson, we will learn about calculating simple interest. We will investigate what the term means, and learn how to calculate it and solve problems.

Unit 32 Repeated Percentage Change

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Repeated percentage decrease**	• In this lesson, we will learn how to apply a repeated percentage decrease by using multipliers
2.	**Repeated percentage increase**	• In this lesson, we will learn how to apply a repeated percentage increase by using multipliers.
3.	**Solve problems with repeated percentage change**	• In this lesson, we will learn how to calculate how many repeated percentage increases or decreases are needed to reach a given amount
4.	**Repeated percentage increase and decrease**	• In this lesson, we will learn how to apply a repeated percentage increase and decrease by using multipliers

Unit 33 FDP Equivalents

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Convert fractions to decimals and percentages without a calculator**	• In this lesson, we will learn how to use non-calculator methods to convert fractions, decimals and percentages
2.	**Simple fraction, decimal and percentage equivalents**	• In this lesson, we will learn how to calculate simple fraction, decimal and percentage equivalent values. We will learn how to convert between fractions, decimals and percentages.
3.	**Convert fractions to decimals and percentages with a calculator**	• In this lesson, we will learn how to use a calculator to convert fractions to decimals and percentages. We will learn what calculator operations will perform these calculations.
4.	**Change percentages to fractions and decimals**	• In this lesson, we will use non-calculator methods to convert percentages to a fraction and decimal

Unit 34 Decimals

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Add and subtract decimals**	• In this lesson, we will learn how to add and subtract decimal numbers using column addition and subtraction methods.
2.	**Multiplication of two decimals**	• In this lesson, we will learn how to multiply decimals by integers, and decimals by decimals. We will compare and use the column method and the grid method in this lesson.
3.	**Division of a decimal number by an integer**	• In this lesson, we will learn how to divide any decimal by an integer. We will use the bus stop method for this lesson.
4.	**Decimal divided by decimal**	• In this lesson, we will learn how to divide any decimal by another decimal using the bus stop method.

Unit 35 Ratio 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Divide a quantity in a given ratio	• In this lesson, we will learn how to use and interpret bar models to divide a quantity in a given ratio and solve problems.
2.	Simplifying ratios	• In this lesson, we will learn how to simplify up to three part ratios, including those with different units of measure.
3.	Find a part given a part	• In this lesson, we will learn how to find a part of a ratio when given another part using bar models and solve similar problems in context
4.	Find the total or difference given a part	• In this lesson, we will learn how to find the total or difference between numbers in a given ratio, when provided with one part of that ratio. We will model solutions using part-part-whole bar models and solve problems in context.

Unit 36 Area and Perimeter

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Area of rectangles, parallelograms and triangles**	• In this lesson, we will practise using the formulae to calculate the area of rectangles, parallelograms and triangles. We will model how to determine which measures within a diagram are appropriate to use for the formulae.
2.	**Area of a trapezium**	• In this lesson, we will practise applying the formula to calculate the area of a trapezium. We will consider examples that use different trapezia in different orientations to help us determine what measures are suitable to use in our formula.
3.	**Area of compound shapes**	• In this lesson, students will find the area of compound shapes by dividing the shape up into simpler more easily recognisable shapes and finding the sum of their parts.

4. **Perimeter of polygons and compound shapes**

- In this lesson, students will find the perimeter of polygons and compound shapes by dividing the shape up into simpler more easily recognisable shapes and finding the sum of their perimeters.

Unit 37 Circles

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Find the circumference of a circle	• In this lesson, we will investigate how to calculate the circumference of a circle. We will explore the formula used for this calculation, and practise finding the circumference from a given radius or diameter.
2.	Find the Diameter or Radius when given the Circumference	• In this lesson, we will find the diameter or radius of a circle when given the circumference. This lesson will involve rearranging the formula for the circumference of a circle.
3.	Find the Area of a Circle	• In this lesson, we will investigate how to find the area of a circle. We will practise finding the area of circles and semicircles when given either the radius or the diameter.
4.	Find the radius and diameter when given the area	• In this lesson, we will learn how to find the radius or diameter of a circle when given the area. This lesson will involve rearranging the formula for the area of a circle.

Unit 38 Parts of circles 1 (Semi and quarter circles)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Know the parts of a circle**	• In this lesson, we will identify parts of a circle by their mathematical names
2.	**Find the area of a semicircle and quarter circle**	• In this lesson, we will find the area of a semicircle and quarter circle in terms of pi or to 3 significant figures
3.	**Find the area of a sector**	• In this lesson, we will find the area of sectors in terms of pi or to 3 significant figures
4.	**Find the radius or diameter given the area of a sector**	• In this lesson, we will find the radius or diameter given the area of a sector

Unit 39 Volume and Surface Area 1 (Prisms)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Volume of Cubes and Cuboids**	• In this lesson, students will calculate the volume of cubes and cuboids. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
2.	**Finding the Volume of Triangular Prisms**	• In this lesson, students will calculate the volume of triangular prisms. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.
3.	**Finding the Surface Area of Triangular Prisms**	• In this lesson, students will calculate the surface area of triangular prisms. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.

4.	**Finding the Surface Area of Cubes and Cuboids**	• In this lesson, students will calculate the surface area of cubes and cuboids. We will introduce the appropriate formulae for these calculations and practise determining which measures within a diagram will be appropriate to use in our formulae.

Unit 40 Angle Facts

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find missing angles in a quadrilateral**	• In this lesson, we will calculate the missing angles in a quadrilateral. We will revisit the properties of angles in a quadrilateral to help us deduce the value of missing angles in problems.
2.	**Find missing angles in a special quadrilateral**	• In this lesson, we will calculate the missing angles in a trapezium, parallelogram and a kite. We will revisit the properties of these quadrilaterals in order to help us deduce the value of missing angles in diagrams.
3.	**Find missing angles around a point and on a straight line**	• In this lesson, we will calculate the missing angles around a point and on a straight line. We will revisit the properties of angles on a straight line and a point, and use this information to help us deduce the value of missing angles in problems.
4.	**Find missing angles in a triangle**	• In this lesson, we will calculate the missing angles in a triangle. We will revisit the properties of angles in a triangle and angles on a straight line to help us deduce the value of missing angles in problems.

Unit 41 Parallel Lines and Polygons 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Angles in parallel lines with one transversal**	• In this lesson, we will find missing angles in parallel lines with one transversal
2.	**Angles in parallel lines with two transversals**	• In this lesson, we will find missing angles in parallel lines with two transversals
3.	**Find missing exterior angles**	• In this lesson, we will calculate the size of a missing exterior angle on a regular and irregular polygon
4.	**Solve problems involving exterior angles**	• In this lesson, we will calculate the number of sides a regular polygon has when given an exterior or interior angle

Unit 42 Polygons 2 (Interior and Exterior)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Find missing exterior angles of polygons**	• In this lesson, we will calculate missing exterior angles of any regular or irregular polygon.
2.	**Finding the sum of interior angles in a polygon**	• In this lesson, we will calculate the sum of interior angles in polygons, and apply this to find missing angles.
3.	**Find the number of sides when given the sum of interior angles**	• In this lesson, we will find the number of sides of a polygon when given only the sum of interior angles.
4.	**Find missing angles when two or more polygons are joined**	• In this lesson, we will apply regular polygon knowledge to find missing angles when two or more polygons are joined together.

Unit 43 Standard Form (Writing and converting)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Convert large numbers to standard form**	• In this lesson, we will convert large ordinary numbers to a standard form number with positive powers of ten.
2.	**Convert large standard form numbers to ordinary form**	• In this lesson, we will convert standard form numbers with positive powers of ten into ordinary numbers
3.	**Convert small numbers to standard form**	• In this lesson, we will convert small ordinary numbers to a standard form number with negative powers of ten
4.	**Convert small standard form numbers to ordinary form**	• In this lesson, we will convert standard form numbers with negative powers of ten into ordinary numbers.

Unit 44 Standard Form 4 Operations

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Adding two numbers in standard form	• In this lesson, we will learn how to add any two numbers together in standard form. We will look at initial cases where powers are equal, and move to more complicated cases where powers are different.
2.	Subtracting two numbers in standard form	• In this lesson, we will learn how to subtract any two numbers in standard form. We will look at initial cases where powers are equal, and move to more complicated cases where powers are different.
3.	Multiplying Two Numbers in Standard Form	• In this lesson, we will learn how to multiply any two numbers in standard form. We will model increasingly difficult questions and finish with a worded question involving unit conversion.
4.	Dividing Two Numbers in Standard Form	• In this lesson, we will learn how to divide any two numbers in standard form. We will model increasingly difficult questions and finish with a worded question.

Unit 45 Ratio 2 (Ratio and Fractions/Direct Proportion/Best Buy) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Ratio and fractions**	• In this lesson, we will learn how to write ratios as fractions. We will investigate the similarities and differences between both formats.
2.	**Compare the cost of two items using the unitary method**	• In this lesson, we will compare the cost of two items using the unitary method. We will learn how to reduce ratios to 1:n using a double number line.
3.	**Using direct proportion graphs**	• In this lesson, we will learn how to use, interpret, and answer questions from interrogating direct proportion graphs.
4.	**Proportion problems**	• In this lesson, we will practise using ratio to solve proportion problems. We will model problems and their solutions in worded problems.

Unit 46 Revise - Solving Equations

8 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solving equations with brackets**	• In this lesson, we will solve equations with brackets including those that first need to be formed from a word problem.
2.	**Solving equations with unknown on both sides**	• In this lesson, we will solve equations with an unknown on both sides including those that first need to be formed from a word problem.
3.	**Solving one-step equations**	• In this lesson, we will solve one step equations including those that first need to be formed from a word problem.
4.	**Solving two-step equations**	• In this lesson, we will solve two step equations including those that first need to be formed from a word problem.
5.	**Solving algebraic fractions (one fraction equal to another)**	• In this lesson, we will be solving algebraic fractions where one fraction is equal to another fraction.

6.	**Solve simple algebraic fractions (equal to a number)**	• In this lesson, we will solve equations with algebraic fractions equal to a number.
7.	**Solve equations that first involve simplification 2 (x + 3) + 5x = 15**	• In this lesson, we will solve equations that first need some type of simplification.
8.	**Solving algebraic fractions (equal to x + a)**	• In this lesson, we will solve equations with an algebraic fraction equal to a number and an unknown value.

Unit 47 Simultaneous Equations (Linear)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Solve linear simultaneous equations where one of the coefficients is equal**	• In this lesson, we will introduce solving simultaneous equations pictorially, then solve algebraically using subtraction and addition. We will look at cases where the coefficients of either x or y are equal.
2.	**Solve linear simultaneous equations where you need to multiply one of the equations**	• In this lesson, we will solve simultaneous equations using the visual representation of a bar model to help us derive values for unknowns in linear equations.
3.	**Solve linear simultaneous equations where you need to multiply both equations**	• In this lesson, we will investigate how to solve simultaneous equation cases where the coefficient of one term is not a multiple or factor of the other. We will use multiplication to find new equations and create common coefficients.
4.	**Solve linear simultaneous equations where you need to first rearrange**	• In this lesson, we will investigate how to solve simultaneous equation cases where we need to rearrange equations first, followed by using multiplication to ensure coefficients in one equation are factors or multiples of the other.

Unit 48 Frequency charts (Data Collection, Bar and Pictograms) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Data collection	• In this lesson, we will investigate the concepts of samples and bias when collecting data.
2.	Bar charts	• In this lesson, we will revisit how to draw and interpret bar charts
3.	Composite and multiple bar charts	• In this lesson, we will learn how to draw and interpret composite and multiple bar charts
4.	Pictograms	• In this lesson, we will learn how to draw and interpret pictograms

Unit 49 Averages (From a list and tables, Stem and Leaf)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Mean from a frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a frequency table.
2.	**Mean from a grouped frequency table**	• In this lesson, we will learn how to calculate the mean of a set of data displayed in a grouped frequency table.
3.	**Find the mean, median, mode and range from a list of numbers**	• In this lesson, we will learn how to calculate the mean, median, mode and range from a list of numbers
4.	**Stem and leaf diagrams**	• In this lesson, we will learn how to draw and interpret stem and leaf diagrams.

Unit 50 Charts and Tables (Pie Chart and Two way tables) 4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Interpret timetables and distance tables**	• In this lesson, we will learn how to interpret timetables and distance tables
2.	**Design and interpret two-way tables**	• In this lesson, we will learn how to design and interpret two-way tables. We will model how to solve problems involving two-way tables.
3.	**Plot and interpret time-series graphs**	• In this lesson, we will learn how to plot and interpret time-series graphs. We will model how to solve problems using these graphs.
4.	**Draw and interpret pie charts**	• In this lesson, we will learn how to draw and interpret pie charts from frequency tables. We will learn how to calculate angles that represent each proportion of data.

Unit 51 Scatter diagrams and Frequency trees

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use a line of best fit on a scatter graph**	• In this lesson, we will learn how to draw and interpret a line of best fit on a scatter graph
2.	**Draw and interpret a frequency tree**	• In this lesson, we will learn how to draw and interpret a frequency tree diagram.
3.	**Plot a scatter graph and describe correlation**	• In this lesson, we will learn how to plot a scatter graph. We will also learn about different types of correlation in scatter graphs, and be able to correctly identify correlation patterns in scatter graphs.
4.	**Identify and explain outliers from a scatter diagram**	• In this lesson, we will learn to identify and explain outliers from a scatter diagram

Unit 52 Probability 1 (Scale and equally likely events)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Use the language of probability and the probability scale**	• In this lesson, we will learn how to apply the vocabulary of probability to scenarios and label the probability scale with words and numbers.
2.	**Calculate probabilities from equally likely events**	• In this lesson, we will learn how to find the probability of a single, equally likely event using fractions, in a range of contexts including spinners, dice and counters. We will also learn how to use probability notation correctly.
3.	**Find the predicted number of outcomes**	• In this lesson, we will understand the definitions of outcome, event and trial. We will calculate predicted outcomes based on the results of a trial or experiment.
4.	**Find the probability of an event not happening including using a table (include mutually exclusive and exhaustive)**	• In this lesson, we will learn how to look at equally likely events and mutually exclusive events and discover the sum of probabilities to aid finding the probability of an event not happening.

Unit 53 Probability 2 (Sample space, Venn diagrams and experimental)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**List outcomes in a sample space diagram (two-way table) and calculate probabilities**	• In this lesson, we will learn how to construct and interpret sample space diagrams (two-way tables) including calculating probabilities, for a variety of contexts.
2.	**Calculate experimental probabilities and make predictions (relative frequency)**	• In this lesson, we will learn how to record data in a relative frequency table and use the probabilities to make predictions, including scenarios such as spinners or rolling dice.
3.	**Find probabilities from Venn diagrams including basic set notation**	• In this lesson, we will learn how to calculate probabilities from Venn diagrams with 2 or more sets, including using the correct notation for union, intersect and complement. It is useful to have a knowledge of how to draw Venn diagrams prior to this lesson but this skill is revised.

4. **Find probabilities from frequency trees**

- In this lesson, we will learn how to use frequency trees to find probabilities including revision on how to draw frequency trees given some information.

Unit 54 Probability 3 (Tree diagrams)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw a tree diagram for independent events**	• In this lesson, we will learn how to draw tree diagrams and complete missing probabilities in tree diagrams for independent events.
2.	**Calculate probabilities of independent events**	• In this lesson, we will learn how to calculate probabilities of outcomes for independent events from tree diagrams
3.	**Draw a tree diagram for dependent events**	• In this lesson, we will learn how to draw tree diagrams and complete missing probabilities in tree diagrams for dependent events.
4.	**Calculate probabilities of dependent events**	• In this lesson, we will learn how to calculate probabilities of outcomes for dependent events from tree diagrams

Unit 55 Straight Line Graphs 2 (Parallel Lines)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Interpret gradient and intercept on real life graphs**	• In this lesson, we will calculate and interpret the gradient and intercepts on real life graphs. We will draw upon our skills of drawing triangles to calculate gradients.
2.	**Write the equation of a straight line if parallel to a line and passing through any point**	• In this lesson, we will investigate how to calculate the equation of a straight line that is parallel to an existing line, and passes through a known coordinate.
3.	**Find the equation of a straight line through two given points**	• In this lesson, we will investigate how to calculate the equation of a line, given two pairs of coordinates that the line passes through.
4.	**Write the equation of a straight line if parallel to a line and passing through (0,n)**	• In this lesson, we will investigate how to calculate the equation of a straight line that is parallel to an existing line, and passes through a known point on the y-axis.

Unit 56 Travel Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Distance-time graphs**	• In this lesson, we will interpret distance-time graphs. We will answer questions regarding how far or how long a journey has been at different points, segments, and overall.
2.	**Calculate speed from distance time-graphs**	• In this lesson, we will calculate speed from distance time-graphs. We will introduce the formula used to calculate this measure, and discuss how to interpret it.
3.	**Acceleration from a velocity-time graph**	• In this lesson, we will calculate acceleration from a velocity-time graph. We will introduce a formula that aids our calculation, and practise using it to determine different accelerations in velocity-time graphs.
4.	**Velocity-time graphs**	• In this lesson, we will interpret velocity-time graphs. We will discuss the notion of constant speed, and what each measure means.

Unit 57 Compound measures

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Use and apply the speed formula	• In this lesson, we will perform calculations involving speed, distance and time and learn about the units involved.
2.	Use and apply the density formula	• In this lesson, we will perform calculations involving mass, density and volume and learn about the units involved.
3.	Use and apply the pressure formula	• In this lesson, we will perform calculations involving pressure, force and area and learn about the units involved.
4.	Solve simple kinematics problems (velocity, initial velocity and acceleration formulae)	• In this lesson, we will begin to learn about Kinematics, substitute into the SUVAT equations and apply the SUVAT equations to problems.

Unit 58 Translate and Vectors 1

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Translate and describe an object given a horizontal or vertical instruction**	• In this lesson, we will translate images in horizontal and vertical directions on a squared grid given worded instructions.
2.	**Represent a column vector as a diagram and using notation**	• In this lesson, we will investigate column vectors and their representative diagrams.
3.	**Write a column vector from a diagram**	• In this lesson, we will accurately determine a column vector from a given diagram.
4.	**Translate and describe a 2D vector**	• In this lesson, we will understand the meaning of a 2D vector, and use them to translate objects and describe translations.

Unit 59 Vectors 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Add two column vectors (including diagrams) to give a resultant vector**	• In this lesson, we will learn how to perform addition using column vectors. We will investigate this process using diagrams.
2.	**Add and subtract two column vectors to give a resultant vector (Part 1)**	• In this lesson, we will practise adding and subtracting column vectors. We will investigate this process using diagrams.
3.	**Multiply a vector by a scalar**	• In this lesson, we will multiply a vector by a given scalar. We will explore this process and make sense of it with suitable diagrams.
4.	**Add and subtract two column vectors to give a resultant vector (Part 2)**	• In this lesson, we will add and subtract column vectors. We will model more complicated examples that use multiples of vectors. We will interpret our answers using suitable diagrams.

Unit 60 Bearings

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Know the cardinal compass and the three rules of bearings**	• In this lesson, we will learn how to identify the points on the cardinal compass and learn the rules of bearings.
2.	**Measure the 3-figure bearing between 2 points and find a point when given a 3-figure bearing and length**	• In this lesson, we will learn how to measure a 3-figure bearing and use this skill to find a point given a 3-figure bearing and a length.
3.	**When given two points and 2 bearings find a third point**	• In this lesson, we will learn how to identify a third point when given two points and two bearings.
4.	**Back bearings**	• In this lesson, we will learn to find back bearings. This means that given the bearing from A to B we will find the bearing of B from A.

Unit 61 Views and Maps

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Faces, Edges and Vertices	• In this lesson, we will learn how to identify and count faces, edges and vertices on 3D shapes.
2.	Draw plan views and elevations of 3D shapes	• In this lesson, we will draw plan views and elevations of 3D shapes.
3.	Sketch 3D shapes when given plan and elevation	• In this lesson, we will sketch 3D shapes when given plan and elevation diagrams.
4.	Use a map scale to work out a length and vice versa	• In this lesson, we will use a map scale to work out an actual length and vice versa.

Unit 62 Constructions

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Construct triangles	• In this lesson, we will accurately construct triangles using a protractor and ruler when given angle and length measurements.
2.	Construct a perpendicular bisector	• In this lesson, we will learn how to construct a perpendicular bisector using a compass, ruler, pencil and paper.
3.	Construct a perpendicular bisector from a point to a line	• In this lesson, we will learn how to construct a perpendicular bisector from a point to a line using a compass, ruler, pencil and paper.
4.	Construct an angle bisector	• In this lesson, we will learn how to construct an angle bisector using a compass, ruler, pencil and paper.

Unit 63 Loci

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	Loci around a point	• In this lesson, we will learn how to draw the locus of points around a single point using a compass, ruler, pencil and paper.
2.	Loci from a line	• In this lesson, we will learn how to draw the locus of points that are a given distance from a line segment. We will do this using a compass, ruler, pencil and paper.
3.	Loci from a shape	• In this lesson, we will learn how to draw the locus of points a given distance from a shape. We will do this using a compass, ruler, pencil and paper.
4.	Equidistant from two points	• In this lesson, we will learn how to draw the locus of points equidistant from two given points. We will do this using a compass, ruler, pencil and paper.

4. Learn More

Learn more contents

These are the different sections that you will find in the learn more section of the Key Stage 4 maths long curriculum plan:

Section number	Section content
1.	Key stage 4 maths introduction
2.	Coherence and flexibility
3.	Knowledge organisation
4.	Knowledge selection
5.	Inclusive and ambitious
6.	Pupil engagement
7.	Motivation through learning

1. Key Stage 4 Maths Introduction

As mathematics teachers we want our pupils to reach fluency in what we are teaching them. In mathematics, fluency requires a deep understanding of concepts and the ability to apply them flexibly and with automaticity. The mathematics curriculum uses multiple representations to help make connections across concepts to help build a deep conceptual understanding. By making consistent use of the same core representations we will scaffold pupils' thinking to help them understand abstract mathematical concepts. The curriculum will also include intelligent practice that is designed to help pupils develop automaticity in their mathematics.

We also aim for our pupils to be able to use the precise language of mathematics, as distinct from everyday language. The curriculum will do this by explicitly teaching mathematical vocabulary and introducing core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

Finally, we also aim for our pupils to be able to think mathematically. The tasks and activities used in the curriculum teach pupils the components of mathematical thinking: to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

Below are the set of principles we have used to build this curriculum, with these ambitions for our pupils in mind.

2. Coherence and flexibility

We strive to support schools by offering a maths curriculum that can fit alongside a range of existing structures. However, complete flexibility over unit ordering is impossible due to the cumulative nature of mathematics and the importance of prior knowledge.

We have grouped lessons into units: coherent sequences of 5 or more lessons. Although each lesson can be accessed individually, explicit connections are made to earlier lessons and later lessons in the same unit. This is because the connections between mathematical concepts are so vital to deepening understanding.

3. Knowledge organisation

The units in the maths curriculum have been organised by strand. We have also created a set of sequences for pupils targeting different grades at GCSE and who are at different stages in KS4, organised based on the topics that are most useful for the GCSE course.

4. Knowledge selection

Our mathematics lessons cover the full scope of the National Curriculum. We have given more time (both in number of lessons and number of units) to those concepts within the National Curriculum that the evidence tells us are foundational to success in maths.

5. Inclusive and ambitious

We know the difference it makes when children believe they “can do” maths. We are guided by the principles of the National Curriculum to ensure that every pupil, regardless of starting point, develops their fluency, reasoning and problem solving. Our activities are scaffolded so all children can succeed. Pupils are offered frequent opportunities to be and feel successful in their maths education.

We develop conceptual understanding by always building new understanding on what pupils already know, by representing concepts in different ways, and by making connections between concepts. The mathematics curriculum makes consistent use of the same core representations across year groups to help pupils connect prior learning to new learning. These representations are selected to make key mathematical structures and ideas accessible to all pupils, no matter what their starting points.

To support every child to communicate mathematically, pupils are introduced to core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

6. Pupil engagement

You learn maths by thinking about maths. Our lessons include mathematical tasks which have multiple solutions. Mathematical thinking is woven into the units using scaffolds and prompts such as ‘what is the same and what’s different?’, ‘is it sometimes, always or never true?’ and ‘which could be the odd one out?’. Throughout the curriculum, all pupils have opportunities to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

7. Motivation through learning

We believe that mathematics is inherently interesting and that all children are entitled to a genuine experience of mathematics. The tasks and activities that pupils engage with harness innate ways of thinking and develop the habits of mind that are drawn upon when being mathematical. Problem solving is at the heart of every lesson with opportunities to investigate, explore and reason.