Maths
Key Stage 4 - Higher

Curriculum map

OAK
NATIONAL
ACADEMY

1. Philosophy

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

Lessons and units are **knowledge and vocabulary rich** so that pupils build on what they already know to develop powerful knowledge.

Knowledge is **sequenced** and mapped in a **coherent** format so that pupils make meaningful connections.

Our **flexible** curriculum enables schools to tailor Oak’s content to their curriculum and context.

Our curriculum is **evidence informed** through rigorous application of best practice and the science of learning.

We prioritise creating a **diverse** curriculum by committing to diversity in teaching and teachers, and the language, texts and media we use, so all pupils feel positively represented.

Creating an **accessible** curriculum that addresses the needs of all pupils is achieved to accessibility guidelines and requirements.

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 $\sqrt{b}$. We will use our knowledge of factors and square roots to reduce surds to their simplest form.
3.	**Simplify a surd of the form $a\sqrt{b}$**	• In this lesson, we will simplify surds of the form $a\sqrt{b}$. We will use our knowledge of factors and square roots to reduce surds to their simplest form.

4. **Write a$\sqrt{b}$ in form $\sqrt{x}$**

- In this lesson, we will write surds of the form a$\sqrt{b}$ in form in the form $\sqrt{x}$. 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.	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.
2.	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.
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.	**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.
2.	**Solve simple algebraic fractions (equal to a number)**	• In this lesson, we will solve equations with algebraic fractions equal to a number.
3.	**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.
4.	**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.

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.	**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.
4.	**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.

Unit 9 Substitution and Rearranging formulae

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**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.
2.	**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.
3.	**Change the subject of a formula**	• In this lesson, we will change the subject of a formula in which the term appears once.
4.	**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.

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 linear and quadratic expressions	• In this lesson, we will multiply a quadratic expression by a linear expression.
4.	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.

Unit 11 Similarity

4 Lessons

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

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 the trigonometry ratios for 0°, 30°,45°,60° and 90°**	• In this lesson, we will use an equilateral triangle and an isosceles triangle to work out the exact values for trigonometry ratios for 0°, 30°,45°,60° and 90°
2.	**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 0°, 30°,45°,60° and 90°
3.	**Use trigonometry to solve bearing problems**	• In this lesson, we will apply prior knowledge of bearings and trigonometry to solve problems.
4.	**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.

Unit 15 Types of Numbers and Rules of Indices

8 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.
5.	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.

6.	**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.
7.	**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.
8.	**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 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.	**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.
4.	**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.

Unit 20 Straight Line Graphs 2 (Parallel Lines)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**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.
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.	**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.

Unit 21 Higher Straight lines (Perpendicular Lines)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	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.
2.	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.
3.	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.
4.	Prove two lines are perpendicular	• In this lesson, we will investigate how to formally prove or disprove whether two lines are perpendicular.

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.	**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
2.	**Stem and leaf diagrams**	• In this lesson, we will learn how to draw and interpret stem and leaf diagrams.
3.	**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.
4.	**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.
5.	**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.

6.	**Identify and explain outliers from a scatter diagram**	• In this lesson, we will learn to identify and explain outliers from a scatter diagram
7.	**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
8.	**Draw and interpret a frequency tree**	• In this lesson, we will learn how to draw and interpret a frequency tree 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 (b is positive)**	• In this lesson, we will use the quadratic formula to solve quadratic equations where the value of b is positive.
2.	**Use formulae to solve quadratic equations (any value)**	• In this lesson, we will use the quadratic formula to solve quadratic equations (any value)
3.	**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.
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.	**Plot other quadratic equations**	• In this lesson, we will plot graphs of quadratic equations of the form $ax^2 + bx + c$ and recognise some of their properties. We will investigate how different coefficients alter the appearance of the quadratic curve.
3.	**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.
4.	**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.

Unit 29 Quadratic Graphs 2 (a>1)

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw quadratic graphs (a > 1)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of x^2 is greater than 1
2.	**Draw quadratic graphs (negative x squared)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of x^2 is negative.
3.	**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.
4.	**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.

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 simple quadratic inequalities	• In this lesson, we will solve simple quadratic inequalities and express solutions using set notation.
3.	Solve quadratic inequalities (a = 1)	• In this lesson, we will solve quadratic inequalities with an x^2 coefficient of 1 and express solutions using set notation.
4.	Solve quadratic inequalities (a > 1)	• In this lesson, we will solve quadratic inequalities with an x^2 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.	**Solve where y = and y = (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.
2.	**Solve where $x^2 + y^2 = r$ and $x + y = 3$ (substituting)**	• In this lesson, we will solve simultaneous equations by substituting a linear equation into a quadratic equation. Examples include quadratics of the form $x^2 + y^2 = r$ and $x + y = 3$ where r can be a square number.
3.	**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.
4.	**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

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 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.

4. **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.

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 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
2.	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
3.	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
4.	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

Unit 38 Advanced Trigonometry 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Area of a Triangle Using A = ½ absinC**	• In this lesson, we will learn how to find the area of a triangle using the formula A = ½ absinC.
2.	**Use A = ½ absinC to Find a Missing Length**	• In this lesson, we will learn how to use the formula A = ½ absinC to find a missing length by rearranging the formula.
3.	**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.
4.	**Sine, Cosine and Area Rules - Mixed Problems**	• In this lesson, we will apply the sine and cosine rules as well as the formula A = ½ absinC in order to solve trigonometry problems.

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: 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.
2.	**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.
3.	**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.
4.	**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.

Unit 41 Circle Theorems 2

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**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.
2.	**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.
3.	**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.
4.	**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.

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: Change of sign**	• In this lesson, we will use substitution to determine whether a solution to an equation lies between two values.
2.	**Solve equations numerically: Trial and improvement**	• In this lesson, we will use trial and improvement to find approximate solutions to algebraic equations.
3.	**Solve equations numerically: Rearrange to form iterative formulae**	• In this lesson, we will rearrange equations to form iterative 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.	Simple direct proportion y = kx	• In this lesson, we will use the formula y=kx to describe directly proportional relationships.
2.	Other direct proportion relationships	• In this lesson, we will learn about non-linear proportional relationships using the formula $y=kx^2$.
3.	Inverse proportion	• In this lesson, we will look at inversely proportional relationships and derive and apply formulae related to them.
4.	Further proportionality	• In this lesson, we will look at examples of proportion where we have three variables involved.

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 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.
2.	**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.
3.	**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.
4.	**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.

Unit 47 Algebraic Proof

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Prove by counter example**	• In this lesson, we will learn how to disprove a statement by providing a counter example.
2.	**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.
3.	**Consecutive number proofs**	• In this lesson, we will learn about algebraic proofs that involve algebraic representations of consecutive numbers.
4.	**Odd and even number proofs**	• In this lesson, we will learn about algebraic proofs that involve algebraic representations of odd and even numbers.

Unit 48 Circle Graphs

4 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Draw and recognise circle graphs of the form $x^2 + y^2 = r^2$**	• In this lesson, we will learn how to draw and recognise circle graphs of the form $x^2 + y^2 = r^2$ where r is the radius of the circle.
2.	**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.
3.	**Intersection of lines and circles**	• In this lesson will will investigate the intersection of a line and a circle.
4.	**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.

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.	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
2.	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.
3.	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
4.	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.

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.	**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.
4.	**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.

5.	**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.
6.	**Plot other quadratic equations**	• In this lesson, we will plot graphs of quadratic equations of the form $ax^2 + bx + c$ and recognise some of their properties. We will investigate how different coefficients alter the appearance of the quadratic curve.
7.	**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.
8.	**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.
9.	**Draw quadratic graphs ($a > 1$)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of x^2 is greater than 1

10.	**Draw quadratic graphs (negative x squared)**	• In this lesson, we will learn how to draw quadratic graphs where the coefficient of x^2 is negative.
11.	**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.
12.	**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.

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.	**Know the Graphs of y=sin(x), y=cos(x) and y=tan(x)**	• In this lesson, we will learn how to identify and sketch the graphs of y=sin(x), y=cos(x) and y=tan(x)
2.	**Recognise, Sketch and Interpret Graphs of Exponential Functions (y=k^x)**	• In this lesson, we will learn how to recognise, sketch and interpret graphs of exponential functions (y=k^x)
3.	**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.
4.	**Transformation of graphs (reflections)**	• In this lesson, we will learn about reflections of graphs. We will practise reflection of quadratic curves.

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.	Estimate and interpret the gradient of a curve	• In this lesson, we will estimate and interpret a gradient for a given curve using triangles.
3.	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.
4.	Estimate the area under a curve	• In this lesson, we will estimate the area under a curve by forming trapeziums from the x axis.

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 and volume of a hemisphere**	• In this lesson, we will learn how to find the surface area and volume of a hemisphere.
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.	**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.
4.	**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.

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.	**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.
3.	**Represent a column vector as a diagram and using notation**	• In this lesson, we will investigate column vectors and their representative diagrams.
4.	**Write a column vector from a diagram**	• In this lesson, we will accurately determine a column vector from a given diagram.

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.	Find the length of a column vector	• In this lesson, we will find the length of a given column vector using Pythagoras' Theorem.
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.	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.
4.	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.

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.	Enlargement with a negative scale factor	• In this lesson, we will learn how to enlarge a shape using a negative scale factor.
2.	Describe an enlargement with a negative scale factor	• In this lesson, we will learn how to describe enlargements with a negative scale factor.
3.	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.
4.	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.

4. Learn More

Contents

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.