

Mathematics Department

Year 9 - Foundation

Scheme of Work

## Key Objectives

- Add, subtract, multiply and divide fractions
- Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100% or as a whole
- Make and justify estimates and approximations of calculations
- Construct and solve linear equations with integer coefficients, using an appropriate method
- Generate terms of a sequence using term to term and position to term definitions of the sequence, on paper and using ICT; write an expression to describe the  $n$ th term of an arithmetic sequence
- Given values for  $m$  and  $c$ , find the gradient of lines given by equations of the form  $y = mx + c$
- Construct functions arising from real life problems and plot their corresponding graphs; interpret graphs arising from real life situations
- Solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and polygons
- Know that translations, rotations and reflections preserve length and angle and map objects on to congruent images
- Know and use the formulae for the circumference and area of a circle

- Design a survey or experiment to capture the necessary data from one or more sources; determine the sample size and degree of accuracy needed; design, trial and if necessary refine data collection sheets
- Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support
- Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems
- Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy

# Number Overview

Unit	Objective
Solving problems and revision	Solve increasingly demanding problems and evaluate solutions; explore connections in mathematics across a range of contexts
Solving problems and revision	Represent problems and synthesise information in algebraic, geometric or graphical form; move from one form to another to gain a different perspective on the problem
N2	Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; use trial and improvement where a more efficient method is not obvious
N2	Extend knowledge of integer powers of 10; multiply and divide by any integer power of 10
N2	Use rounding to make estimates; round numbers to the nearest whole number or to one or two decimal places
N2	Understand the equivalence of simple algebraic fractions; know that a recurring decimal is an exact fraction
N1	Use efficient methods to <b>add, subtract, multiply and divide fractions</b> ; interpreting division as a multiplicative inverse; cancel common factors before multiplying or dividing
Solving problems and revision	Recognise when fractions or percentages are needed to compare proportions; solve problems using percentage change
N1 Solving problems and revision	<b>Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole</b> ; compare two ratios; interpret and use ratio in a range of contexts, including solving word problems
N1	understand the effects of multiplying and dividing by numbers between 0 and 1; use the laws of arithmetic and inverse operations
GCSE Preparation	Understand the order of precedence and effect of powers
N1	Use known facts to derive unknown facts; extend mental methods of calculation, working with decimals,

	fractions, percentages, factors, powers and roots; solve word problems mentally
N1	<b>Make and justify estimates and approximations of calculations</b>
N2	Use standard column procedures to add and subtract integers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places; multiply and divide by decimals, dividing by transforming to division by an integer
N2	Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of any calculation; use the constant, ( and sign change keys, function keys for powers, brackets and the memory
N2 Solving problems and revision	Enter numbers and interpret the display in context (negative numbers, fractions, decimals, percentages, money, metric measures, time)
N1	Check results using appropriate methods

# Algebra Overview

A4	Use the prime factor decomposition of a number
A4	Use ICT to estimate square roots and cube roots
A4	Use index notation for integer powers and simple instances of the index laws
A3	Distinguish the different roles played by letter symbols in equations, identities, formulae and functions
A4	Use index notation for integer powers and simple instances of the index laws
A5	Simplify or transform algebraic expressions by taking out single term common factors; add simple algebraic fractions
A3	<b>Construct and solve linear equations with integer coefficients</b> (with and without brackets, negative signs anywhere in the equation, positive or negative solution), <b>using an appropriate method</b>
A3	Solve problems involving direct proportion using algebraic methods, relating algebraic solutions to graphical representations of the equations; using ICT as appropriate
A5	Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae and, in simple cases, change its subject
A1&2	<b>Generate terms of a sequence using term to term and position to term definitions of the sequence, on paper and using ICT</b>
A1&2	Generate sequences from practical contexts and <b>write an expression to describe the nth term of an arithmetic sequence</b>
A3	Find the inverse of a linear function
A4 A5 Solving problems and revision	Generate points and plot graphs of linear functions(y given implicitly in terms of x), eg $ay + bx + c = 0$ , $y + bx + c = 0$ , on paper and using ICT; <b>given values for m and c, find the gradient of lines given by equations of the form <math>y = mx + c</math></b>
A1&2 A3	<b>Construct functions arising from real life problems and plot their corresponding graphs; interpret graphs arising from read situations;</b> including distance-time graphs



# Shape, Space and Measures Overview

SSM4	Present a concise, reasoned argument, using symbols, diagrams, graphs and related explanatory text; give solutions to problems an appropriate degree of accuracy
SSM4	Suggest extensions to problems, conjecture and generalise; identify exceptional cases or counter-examples, explaining why
SSM3	Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100% or as a whole; compare two ratios; interpret and use ratio in a range of contexts, including solving word problems
SSM1	Explain how to find, calculate and use: <ul style="list-style-type: none"> <li>- the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons</li> <li>- the interior and exterior angles of regular polygons</li> </ul>
SSM1 Solving Problems and revision	<b>Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons</b> , justifying inferences and explaining reasoning with diagrams and text
SSM1	Know the definition of a circle and the names of its parts; explain why inscribed regular polygons can be constructed by equal divisions of a circle
SSM4	Visualise and use 2D representations of 3D objects; analyse 3D shapes through 2D projections, including plans and elevations
SSM3	Transform 2D shapes by combinations of translations, rotations and reflections, on paper and using ICT; <b>know that translations, rotations and reflections preserve length and angle and map objects on to congruent images</b> ; identify reflection symmetry in 3D shapes
SSM3	Enlarge 2D shapes, given the centre of enlargement and a whole number scale factor, on paper and using ICT; identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments; recognise that enlargements preserve angle but not length, and understand the implications of enlargement for perimeter
SSM3	Use and interpret maps and scale drawings

SSM1	Use straight edge and compasses to construct a triangle, given right angle, hypotenuse and side(RHS); use ICT to explore constructions of triangles and other 2D shapes
SSM2 SSM4	Use units of measurement to calculate, measure and solve problems in a variety of contexts; convert between area measures( $\text{mm}^2$ , to $\text{cm}^2$ , $\text{cm}^2$ to $\text{m}^2$ , and vice versa) and between volume measures( $\text{mm}^3$ to $\text{cm}^3$ , $\text{cm}^3$ to $\text{m}^3$ and vice versa)

# Handling Data Overview

HD3	Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; use trial and improvement where a more efficient method is not obvious
HD1	Suggest a problem to explore using statistical methods, frame questions and raise conjectures
HD1 HD3	Discuss how data relate to a problem; identify possible sources, including primary and secondary sources
HD1	<b>Design a survey or experiment to capture the necessary data from one or more sources; determine the sample size and degree of accuracy needed; design, trial and if necessary refine data collection sheets;</b> construct tables for large discrete and continuous sets of raw data, choosing suitable class intervals; design and use two way tables
HD3	Gather data from specified secondary sources, including printed tables and lists from ICT based sources
HD3	Find summary values that represent the raw data, and select the statistics most appropriate to the problem
HD1 HD3	Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, including: <ul style="list-style-type: none"> <li>- line graphs for time series</li> <li>- scatter graphs to develop further understanding of correlation</li> </ul> Identify key features present in the data
HD1 HD3 Solving problems and revision	Interpret graphs and diagrams and draw inferences to support or cast doubt on initial conjectures; have a basic understanding of correlation
HD1	Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics
HD3	<b>Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support,</b> using ICT as appropriate
HD2 HD4	Use the vocabulary of probability in interpreting results involving uncertainty and prediction

HD2 HD4	Identify all the mutually exclusive outcomes of an experiment; <b>know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems</b>
HD2 HD4	Estimate probabilities from experimental data
HD4	Compare experimental and theoretical probabilities in a range of contexts: appreciate the difference between mathematical explanation and experimental evidence

# Mental and Oral Activities

## Autumn Term

- Order, add, subtract, multiply and divide integers.
- Multiply and divide decimals by 10, 100, 1000, 0.1 and 0.01.
- Count on and back in steps of 0.4, 0.75,  $\frac{3}{4}$ ...
- Round numbers, including to one or two decimal places.
- Know and use squares, cubes, roots and index notation.
- Know or derive quickly prime numbers less than 30 and factor pairs for a given number.
- Convert between fractions, decimals and percentages. Know that 0.005 is half of one per cent.
- Find fractions and percentages of quantities.
- Know or derive complements of 0.1, 1, 10, 50, 100, 1000.
- Add and subtract several small numbers or several multiples of 10, e.g.  $250 + 120 - 190$ .
- Use jottings to support addition and subtraction of whole numbers and decimals.
- Use knowledge of place value to multiply and divide, e.g.  $432 \times 0.01$ ,  $37 \div 0.01$ ,  $0.04 \times 8$ ,  $0.03 \div 5$ ,  $13 \times 1.4$ .
- Recall multiplication and division facts to  $10 \times 10$ . Derive products and quotients of multiples of 10, 100, 1000.
- Use factors to multiply and divide mentally, e.g.  $22 \times 0.02$ ,  $420 \div 15$ .
- Multiply and divide a two-digit number by a one-digit number.
- Use approximations to estimate the answers to calculations, e.g.  $39 \times 2.8$ .
- Solve equations, e.g.  $n(n - 1) = 56$

- Visualise, describe and sketch 2-D shapes.
- Recall and use formulae for the perimeter of a rectangle, and areas of rectangles and triangles.
- Calculate volumes of cuboids.
- Estimate and order acute, obtuse and reflex angles.
- Use metric units (length, mass, capacity) and units of time for calculations.
- Use metric units for estimation (length, mass, capacity).
- Convert between metric units, including area, volume and capacity measures.
- Discuss and interpret graphs.
- Calculate a mean using an assumed mean.
- Apply mental skills to solve simple problems.

## Spring Term

- Order, add, subtract, multiply and divide integers.
- Find products of small integer powers.
- Know and use squares, cubes, roots and index notation.
- Know or derive quickly the prime factorisation of numbers to 30 and factor pairs for a given number.
- Find highest common factors (HCF) and lowest common multiples (LCM), e.g. the HCF of 36 and 48.
- Convert between improper fractions and mixed numbers. Simplify fractions by cancelling.
- Find the outcome of a given percentage increase or decrease.
- Know or derive complements of 0.1, 1, 10, 50, 100, 1000.
- Use jottings to support addition, subtraction, multiplication and division.
- Recall multiplication and division facts to  $10 \times 10$ . Derive products and quotients of multiples of 10, 100, 1000.
- Use known facts to derive unknown facts, e.g. derive  $36 \times 24$  from  $36 \times 25$ .
- Use knowledge of place value to multiply and divide decimals by multiples of 0.1 and 0.01, e.g.  $0.24 \times 0.4$ ,  $720 \div 0.03$ .
- Use approximations to estimate the answers to calculations, e.g.  $39 \times 2.8$ .
- Solve equations, e.g.  $n(n - 1) = 56$ ,  $\square + \square = 46$ ,  $(3 + x)^2 = 25$ .
- Visualise, describe and sketch 2-D shapes, 3-D shapes and simple loci.
- Estimate bearings.
- Use metric units (length, area and volume) and units of time for calculations.
- Use metric units for estimation (length, area and volume).
- Convert between metric units, including area, volume and capacity measures.
- Recall and use formulae for areas of rectangle, triangle, parallelogram, trapezium and circle.

- Calculate volumes of cuboids and prisms.
- Discuss and interpret graphs.
- Solve simple problems involving probabilities.
- Apply mental skills to solve simple problems.

## Summer Term

- Order, add, subtract, multiply and divide integers.
- Round integers and decimals.
- Know and use squares, cubes, roots and index notation.
- Find highest common factors (HCF) and lowest common multiples (LCM).
- Convert between fractions, decimals and percentages, and between improper fractions and mixed numbers.
- Find fractions and percentages of quantities and the outcome of a given percentage increase or decrease.
- Know or derive complements of 0.1, 1, 10, 50, 100, 1000.
- Use jottings to support addition, subtraction, multiplication and division.
- Recall multiplication and division facts to  $10 \times 10$ . Derive products and quotients of multiples of 10, 100, 1000.
- Use knowledge of place value to multiply and divide decimals by 0.1 and 0.01, e.g.  $0.24 \times 0.4$ ,  $720 \div 0.03$ .
- Use approximations to estimate the answers to calculations, e.g.  $0.39 \times 2.8$ .
- Solve equations, e.g.  $n(n - 1) = 56$ ,  $(3 + x)^2 = 25$ ,  $(12 - x)^2 = 49$ ,
- Visualise, describe and sketch 2-D shapes, 3-D shapes and simple loci.
- Estimate and order angles and bearings.
- Use metric units (length, mass, capacity, area and volume) and units of time for calculations.
- Use metric units for estimation (length, mass, capacity, area and volume).
- Convert between metric units including area, volume and capacity measures.
- Recall and use formulae for the perimeter of a rectangle and the circumference of a circle.
- Recall and use formulae for areas of rectangle, triangle, parallelogram, trapezium and circle.
- Calculate volumes of cuboids and prisms.

- Discuss and interpret graphs.
- Solve simple problems involving probabilities.
- Apply mental skills to solve simple problems.

# Autumn Term

## Teaching Objectives for the main activities

UNIT 1	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Algebra 1 &amp; 2</b> (5 hours) Sequences and functions</p> <p>Functions</p> <p>Graphs</p>	<ul style="list-style-type: none"> <li>Recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back.</li> <li>Know squares to at least <math>10 \times 10</math>.</li> </ul> <ul style="list-style-type: none"> <li>Plot coordinates and draw graphs</li> </ul>	<ul style="list-style-type: none"> <li>Generate and describe integer sequences using flow diagrams <b>(MF: 1)</b></li> <li><b>Generate terms of a sequence using position to term definitions of the sequence, on paper and using ICT</b> <b>(MF: 1, 2)</b></li> <li>Generate sequences from practical contexts <b>(MF: 1, 2)</b></li> <li>Express simple functions in symbols <b>(MF: 1, 2)</b></li> <li>Represent mappings expressed algebraically <b>(MF: 1, 2)</b></li> </ul> <ul style="list-style-type: none"> <li>Plot the graphs of linear functions, where <math>y</math> is given explicitly in terms of <math>x</math>, on paper and using ICT(1)</li> </ul>	<ul style="list-style-type: none"> <li><b>Write an expression to describe the <math>n</math>th term of an arithmetic sequence</b> <b>(MF: 2)</b></li> </ul> <ul style="list-style-type: none"> <li><b>Interpret graphs arising from real situations (distance-time graphs)</b> <b>(MF: 2)</b></li> </ul>

UNIT 2	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Number 1</b> (8 hours) Fractions, decimals, percentage</p> <p>Decimals</p> <p>Ratio</p> <p>BODMAS</p>	<ul style="list-style-type: none"> <li>• Use fraction notation to express a smaller whole number as a fraction of a larger one</li> <li>• Identify equivalent fractions</li> <li>• Simplify fractions by cancelling all common factors</li>   <li>• Order integers</li> <li>• Use decimal notation in context, such as money</li> <li>• Order decimal numbers with up to 2 decimal places</li>   <li>• Understand the order of precedence</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Add and subtract fractions by writing them with a common denominator</b> (MF: 1, 2)</li>   <li>• Calculate fractions of quantities (fraction answers). Multiply and divide an integer by a fraction (MF: 1, 2)</li>   <li>• Order decimal numbers with up to 3 decimal places (MF: 1)</li> <li>• Round positive numbers to any given power of 10 and decimals to the nearest whole number, one or two decimal places (MF: 1)</li> <li>• Compare ratios and reduce to its simplest form (MF: 1, 2)</li> <li>• Interpret and use ratio in a range of contexts, including solving word problems involving inverse proportion (MF: 1, 2)</li> <li>• Understand the order of precedence and the effect of powers (MF: 2)</li> </ul>	<ul style="list-style-type: none"> <li>• Use efficient methods to multiply and divide fractions, interpreting division as a multiplicative inverse. Cancel common factors before multiplying or dividing.</li>   <li>• <b>Know which value to consider as 100%, or a whole, in problems involving comparisons</b></li>   <li>• <b>Make and justify estimates and approximations of calculations</b></li>   <li>• <b>Calculate using ratios</b></li> </ul>



UNIT 4	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<b>Shape, Space and Measures 1</b> (7 hours)	<ul style="list-style-type: none"> <li>• Identify parallel and perpendicular lines</li> <li>• Measure and draw angles</li>   <li>• Know the sum of angles within a triangle is <math>180^\circ</math></li>   <li>• Name polygons</li>   <li>• Draw a circle given its radius</li> </ul>	<ul style="list-style-type: none"> <li>• Identify alternate and corresponding angles and solve problems using the properties of parallel and intersecting lines <b>(MF: 1)</b></li> <li>• Understand a proof that the sum of the angles within a triangle is <math>180^\circ</math> and the exterior angle of a triangle is equal to the sum of the two interior opposite angles <b>(MF: 1)</b></li> <li>• Understand a proof that the sum of the angles within a quadrilateral is <math>360^\circ</math> <b>(MF: 1)</b></li> <li>• Explain how to find, calculate and use the sum of the interior angles of polygons and find the interior angles of regular polygons <b>(MF: 1, 2)</b></li> <li>• <b>Solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text</b> <b>(MF: 1, 2)</b></li> <li>• Use straight edge and compasses to construct the: midpoint and perpendicular bisector of a line segment; the bisector of an angle; the perpendicular from a point to a line; the perpendicular from a point on a line <b>(MF: 1)</b></li> <li>• <b>Know the definition of a circle and the names of its parts</b> <b>(MF: 1)</b></li> </ul>	<ul style="list-style-type: none"> <li>• Find, calculate and use the sums of interior and exterior angles of quadrilaterals, pentagons and hexagons</li>   <li>• Distinguish between conventions, definitions and derived properties</li>   <li>• Use straight edge and compasses to construct a right angled triangle, given right angle, hypotenuse and side(RHS)</li> <li>• Use ICT to explore constructions of triangles and other 2D shapes</li> </ul>



# Spring Term

Teaching objectives for the main activities

UNIT 6	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Shape, Space and Measure 2</b> (6 hours) Measures and mensuration</p>	<ul style="list-style-type: none"> <li>• Calculate the area of a rectangle</li> </ul>	<ul style="list-style-type: none"> <li>• Deduce and use the formula for the area of a triangle <b>(MF: 1)</b></li> <li>• Calculate areas of compound shapes made from rectangles and triangles <b>(MF: 1)</b></li> <li>• Deduce and use formulae for the area of a parallelogram and a trapezium <b>(MF: 1)</b></li> <li>• Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints and gallons) <b>(MF: 1)</b></li> <li>• Know and use the formula for the volume of a cuboid <b>(MF: 1)</b></li> <li>• Calculate volumes and surface areas of cuboids and shapes made from cuboids <b>(MF: 1)</b></li> <li>• Given the coordinates of Points A and B, find the midpoint of the line segment AB <b>(MF: 1)</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Know and use the formula for the circumference and area of a circle</b></li> <li>• Use units of measurement to calculate, measure and solve problems in a variety of contexts; convert between area measures(<math>\text{mm}^2</math>, to <math>\text{cm}^2</math>, <math>\text{cm}^2</math> to <math>\text{m}^2</math>, and vice versa) and between volume measures(<math>\text{mm}^3</math> to <math>\text{cm}^3</math>, <math>\text{cm}^3</math> to <math>\text{m}^3</math> and vice versa)</li> </ul>



		<p>calculations with numbers of any size, knowing not to round during intermediate steps of a calculation. Use the bracket, fraction, square, square root, function key for powers and roots, memory and sign change keys</p> <p>(MF: 1, 2)</p> <ul style="list-style-type: none"><li>• <b>Solve substantial problems by breaking them down into simpler tasks, using a range of efficient techniques, methods and resources including ICT. Use trial and improvement where a more efficient method is not obvious</b></li></ul> <p>(MF: 1, 2)</p>	<p>cube root keys</p>
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UNIT 10	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Shape, Space and Measure 3</b> (4 hours) Enlargements</p> <p>Reflection symmetry</p> <p>Scale drawings</p>	<ul style="list-style-type: none"> <li>• Understand and use the language and notation associated with enlargement</li> <li>• Recognise reflective symmetry in 2D shapes</li> <li>• Reflect 2D shapes in a mirror line</li> <li>• Make simple scale drawings</li> <li>• Reduce a ratio to its simplest form</li> </ul>	<ul style="list-style-type: none"> <li>• Enlarge 2D shapes, given a centre of enlargement and a whole number scale factor, on paper and using ICT <b>(MF: 2)</b></li> <li>• Identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments <b>(MF: 2)</b></li> <li>• Recognise that enlargements preserve angle but not length, and understand the implications of enlargement for perimeter <b>(MF: 2)</b></li> <li>• Identify reflection symmetry in 3D shapes <b>(MF: 1, 2)</b></li> <li>• Make simple scale drawings <b>(MF: 1)</b></li> <li>• Use and interpret maps and scale drawings <b>(MF: 1)</b></li> <li>• Reduce a ratio to its simplest form, including a ratio expressed in different units, in a range of contexts <b>(MF: 1)</b></li> </ul>	<ul style="list-style-type: none"> <li>• Understand congruence</li> </ul>

## Summer Term

## Teaching objectives for the main activities

UNIT 11	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<b>Equations and Formulae</b> (5 hours)	<ul style="list-style-type: none"> <li>• Use indices to represent squares</li>   <li>• Substitute values into expressions</li>           <li>• Plot coordinates in all 4 quadrants</li> </ul>	<ul style="list-style-type: none"> <li>• Simplify linear expressions by collecting like terms <b>(MF: 1)</b></li> <li>• Multiply a single term over a bracket and simplify by collecting like terms <b>(MF: 1)</b></li> <li>• Substitute numbers into expressions or formulae <b>(MF: 1, 2)</b></li> <li>• Derive and use simple formulae <b>(MF: 1)</b></li> <li>• Use formulae from mathematics and other subjects <b>(MF: 1)</b></li>   <li>• Generate points and plot the graphs of linear functions (y given implicitly in terms of x) e.g. <math>y + ax + b = 0</math>, on paper and using ICT <b>(MF: 1, 2)</b></li> </ul>	<ul style="list-style-type: none"> <li>• Derive a formula and, change its subject</li>       <li>• Substitute negative and decimal values into expressions involving powers</li> </ul>

UNIT 12	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Solving Problems and Revision</b> (6 hours) <b>Number</b> (Fractions, decimals and percentages, 4 rules, ratio and directed numbers)</p> <p><b>Algebra</b> (Basic and manipulative algebra and linear equations)</p> <p><b>Graphs</b> (Basic graphs and real life graphs)</p> <p><b>Shape, Space and Measure</b> (Volume and area, symmetry, angles and enlargements)</p>	<ul style="list-style-type: none"> <li>• Try different approaches and find ways of overcoming difficulties that arise when solving problems</li> </ul>	<ul style="list-style-type: none"> <li>• Solve increasingly demanding problems and evaluate solutions <b>(MF: 1, 2)</b></li> <li>• <b>Make and justify estimates and approximations of calculations</b></li> <li>• Solve problems involving percentage changes <b>(MF: 1, 2)</b></li> <li>• Interpret and use ratio in a range of contexts, including solving word problems <b>(MF: 1, 2)</b></li> <li>• Represent problems and synthesise information in algebraic form <b>(MF: 1, 2)</b></li> <li>• Represent problems and synthesise information in graphical form <b>(MF: 1, 2)</b></li> <li>• Represent problems and synthesise information in geometric form <b>(MF: 1, 2)</b></li> <li>• <b>Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole</b></li> </ul>

<p><b>Handling data</b> (Probability, averages, surveys and scatter diagrams)</p>		<p><b>(MF: 1, 2)</b></p> <ul style="list-style-type: none"><li>• Interpret graphs and diagrams and draw inferences to support or cast doubt on initial conjectures; have a basic understanding of correlation</li></ul> <p><b>(MF: 1, 2)</b></p> <ul style="list-style-type: none"><li>• Analyse data to find patterns and exceptions, look for cause and effect and try to explain anomalies</li></ul> <p><b>(MF: 1, 2)</b></p>	
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UNIT 13	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Handling data</b> (3 hours) Revision</p> <p>Handling data project</p>	<ul style="list-style-type: none"> <li>• Extract and interpret information presented in simple tables and lists</li> <li>• Interpret information presented in bar charts and pictograms</li>   <li>• Construct, on paper and using ICT, bar charts and frequency diagrams</li> <li>• Interpret tables, graphs and diagrams for continuous data, and draw inferences that relate to the problem being discussed</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Decide which data to collect to answer a question, and the degree of accuracy needed <b>(MF: 1)</b></li> <li>• Discuss how data relate to a problem: Identify possible sources of data, including primary and secondary data <b>(MF: 1, 2)</b></li> <li>• Construct and use stem and leaf diagrams <b>(MF: 1)</b></li> <li>• Calculate statistics, including with a calculator; recognise when it is appropriate to use the modal class for grouped data <b>(MF: 1)</b></li> <li>• Find summary values that represent the raw data, and select the statistics most appropriate to the problem <b>(MF: 2)</b></li> <li>• Select, construct and modify, on paper and using ICT, bar charts and frequency diagrams for continuous data <b>(MF: 1)</b></li> <li>• Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry <b>(MF: 2)</b></li> <li>• Interpret graphs and diagrams for</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicate interpretations and results of statistical enquiry using selected tables, graphs and diagrams in support, using ICT as appropriate</b></li> </ul>

		<p>continuous data and draw inferences that relate to the problem being discussed; relate summarised data to the questions being explored</p> <p>(MF: 1, 2)</p> <ul style="list-style-type: none"><li>• <b>Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, using ICT</b></li></ul> <p>(MF: 2)</p>	
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UNIT 14	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p><b>Shape, Space and Measure 4</b> (6 hours) Revision</p> <p>Investigation</p> <p>Symmetry revision</p> <p>Investigation</p>	<ul style="list-style-type: none"> <li>• Calculate perimeters and areas of simple shapes</li> <li>• Reflect simple shapes in a mirror line</li> </ul>	<ul style="list-style-type: none"> <li>• Use formulae for the area of a triangle, parallelogram and trapezium <b>(MF: 1)</b></li> <li>• Calculate volumes and surface areas of cuboids <b>(MF: 1)</b></li> <li>• Use units of measurement to calculate and solve problems in a variety of contexts <b>(MF: 2)</b></li> <li>• <b>Present a concise, reasoned argument , using symbols, diagrams and related explanatory text</b> <b>(MF: 1, 2)</b></li> <li>• Identify all of the symmetries in 2D shapes <b>(MF: 1)</b></li> <li>• Identify reflection symmetry in 3D shapes <b>(MF: 1, 2)</b></li> <li>• Use rotations and reflections on paper <b>(MF: 2)</b></li> <li>• <b>Present a concise, reasoned argument , using symbols, diagrams and related explanatory text</b> <b>(MF: 1, 2)</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Know and use the formulae for the circumference and area of a circle</b></li> <li>• Calculate the surface area and volume of right prisms</li> <li>• Visualise and use 2D representations of 3D shapes</li> </ul>

UNIT 15	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<p data-bbox="188 233 439 328"><b>Handling data 4</b> (3 hours) Probability revision</p> <p data-bbox="188 975 353 1038">Probability investigation</p>		<ul data-bbox="1032 233 1518 1184" style="list-style-type: none"> <li data-bbox="1032 233 1518 328">• Use the vocabulary of probability in interpreting results involving uncertainty and prediction <b>(MF: 1, 2)</b></li> <li data-bbox="1032 368 1518 536">• Find and record all possible mutually exclusive outcomes for two successive events in a systematic way, using diagrams and tables <b>(MF: 1, 2)</b></li> <li data-bbox="1032 576 1518 639">• Estimate probabilities from experimental data <b>(MF: 1, 2)</b></li> <li data-bbox="1032 679 1518 879">• Compare experimental and theoretical probabilities in a range of contexts; appreciate the difference between mathematical explanation and experimental evidence <b>(MF: 1, 2)</b></li> <li data-bbox="1032 951 1518 1184">• Understand that different outcomes may result from repeating an experiment and that increasing the number of experiments generally leads to better estimates of probability <b>(MF: 1, 2)</b></li> </ul>	<ul data-bbox="1552 368 2011 536" style="list-style-type: none"> <li data-bbox="1552 368 2011 536">• <b>Know that the sum of probabilities of all mutually exclusive outcomes is 1, and use this when solving problems</b></li> </ul>

UNIT 16	SUPPORT: Year 8 and Level 3	CORE: Level 4 + 5 Teaching Objectives	EXTENSION: Level 6/7
<b>GCSE Preparation</b> (9 hours)	<ul style="list-style-type: none"> <li>• Knowledge and use of the order of operations (BODMAS)</li> <li>•</li> <li>• Recognise negative numbers in context</li>   <li>• Recall multiplication facts up to 10 x 10 and quick derivation of corresponding division facts</li>   <li>• Use decimal notation in context</li>   <li>• Use simple fractions and recognise when two simple fractions are</li> </ul>	<ul style="list-style-type: none"> <li>• Know and use the order of operations, including brackets <b>(MF: 1)</b></li> <li>• Understand negative numbers as a position on a number line. Order, add and subtract negative numbers in context <b>(MF: 1)</b></li> <li>• Recognise and use multiples, factors (division), common factor, highest common factor, lowest common multiple and prime <b>(MF: 1)</b></li> <li>• Recognise and use squares, positive square roots, cubes and cube roots and index notation for small positive integer powers <b>(MF: 1)</b></li> <li>• Use standard column procedures to add and subtract integers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places; multiply and divide by decimals, dividing by transforming to division by an integer <b>(MF: 1)</b></li> <li>• Solve problems that involve multiplying or dividing any three digit number by any two digit number, and apply to real situations <b>(MF: 1, 2)</b></li> <li>• Calculate fractional or percentage parts of quantities, using a</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole</b></li> </ul>

	<p>equivalent</p> <ul style="list-style-type: none"><li>• Reduce a fraction to its simplest form by cancelling common factors</li></ul>	<p>calculator where appropriate</p> <p><b>(MF: 2)</b></p> <ul style="list-style-type: none"><li>• <b>Add and subtract fractions by writing with a common denominator</b></li></ul> <p><b>(MF: 2)</b></p> <ul style="list-style-type: none"><li>• <b>Construct and solve simple linear equations with integer coefficients, using an appropriate method</b></li></ul> <p><b>(MF: 2)</b></p>	<ul style="list-style-type: none"><li>• Multiply and divide fractions</li></ul>
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