Key Stage 3 *National Strategy*

Sample medium-term plans for mathematics

Contents

Introduction

The *Framework for teaching mathematics: Years 7, 8 and 9* provides teachers with guidance on meeting the National Curriculum requirements for mathematics. It sets out yearly teaching programmes showing how objectives for teaching mathematics can be planned from Year 7 to Year 9. A key task in developing medium-term plans for Key Stage 3 mathematics is to identify the objectives for the units of work that are going to be taught. In doing this, schools may choose to start from their existing schemes of work or, alternatively, may find that these sample plans provide a useful starting point.

The sample plans are designed to continue the progression and expectations established in the yearly teaching programmes up to Year 6. They are based on the examples of planning charts in the Framework. There are many other ways to organise the mathematics curriculum in Key Stage 3. The planning charts indicate dependencies between topics but the order and content of the units can be adjusted.

Each sample plan identifies **core objectives that define a minimum expectation for the majority of pupils in a particular year group**. Plans for particular year groups are designed to show:

- progression in the teaching objectives for each strand of the curriculum;

- links between the teaching objectives, bringing together related ideas across the strands;

- opportunities to revisit topics during the year (the pitch of the second and subsequent units of a topic needs careful adjusting in the light of teachers' assessment of pupils' progress);

- how objectives for using and applying mathematics can be incorporated into units.

For each term, suggested objectives for oral and mental mathematics are also identified. Oral and mental work can both support the main teaching programme as well as provide a means of regularly revisiting important elements.

Many schools set pupils for mathematics. Teachers of higher sets may well base their pupils' work on the programme for a later year group, while teachers of lower sets may need to draw on objectives in the teaching programmes from a previous year group. As always, the success of setting depends on teachers in the mathematics department being involved in careful monitoring, close teamwork and co-operative planning to make sure that expectations for all pupils are suitably high and that lower expectations are not justified simply because pupils are in a lower set.

There are some secondary schools where, at present, relatively few pupils attain level 5 or above at the end of Key Stage 3. Pupils may lack a secure understanding of some of the work they have been taught earlier. To begin with, these schools should look carefully at the programmes for Year 5 and Year 6 and draw suitable teaching objectives from them when they are planning work for Year 7, making corresponding adjustments for Years 8 and 9. A decision like this would need to be reviewed before the start of the next school year to allow for improving standards over time.
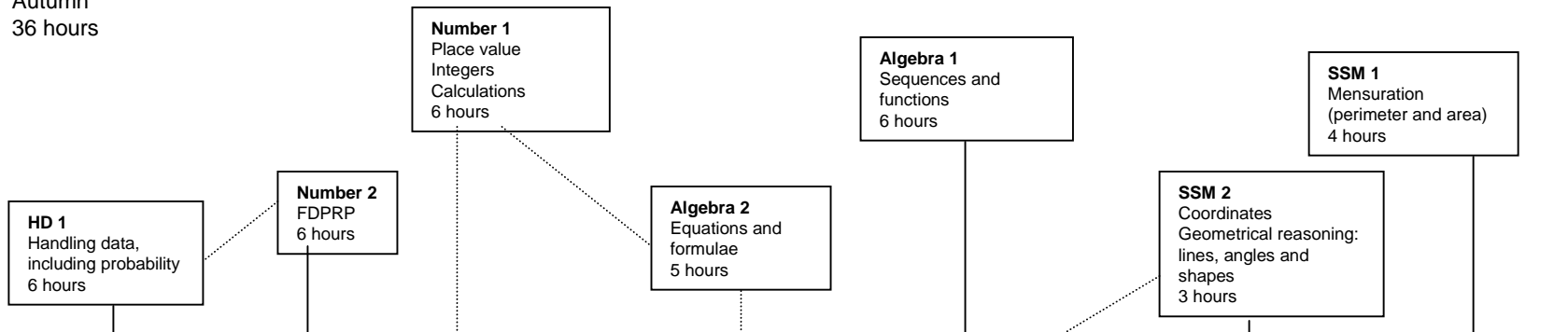
How the plans are set out

Teaching objectives for oral and mental activities are placed at the beginning of the plan for each term. Objectives for the main activities are set out in four columns:
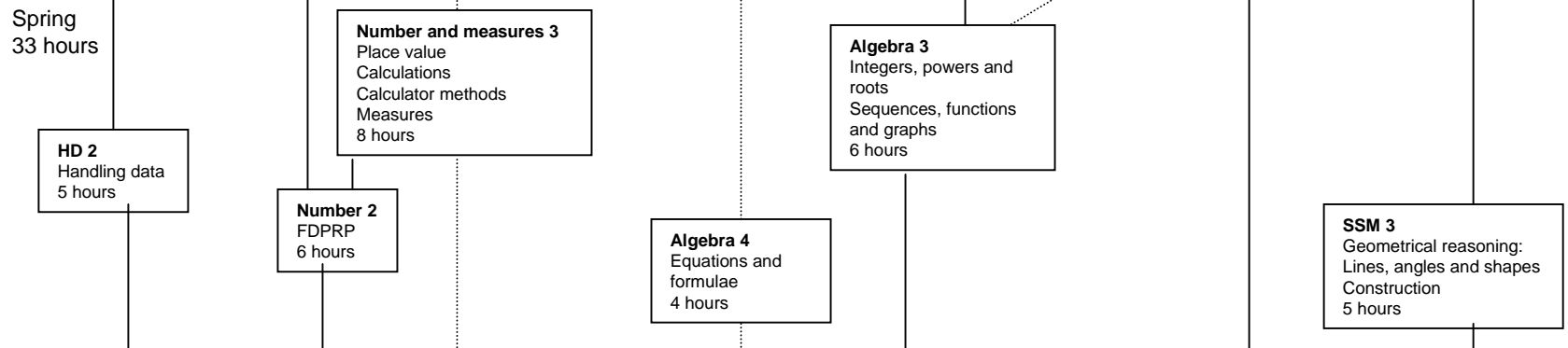
- The first identifies the areas of mathematics studied in the unit and identifies links to the supplement of examples in the Framework.

- The second identifies support objectives from previous yearly teaching programmes, as in *Springboard 7*. These are linked to the core objectives for each unit.

- The third column sets out the core objectives for the year group, the ones you would expect to focus on for the majority of pupils.

- The fourth provides extension objectives, to stretch able pupils, drawn from the next year's teaching programme. These are linked to the core objectives for the unit.
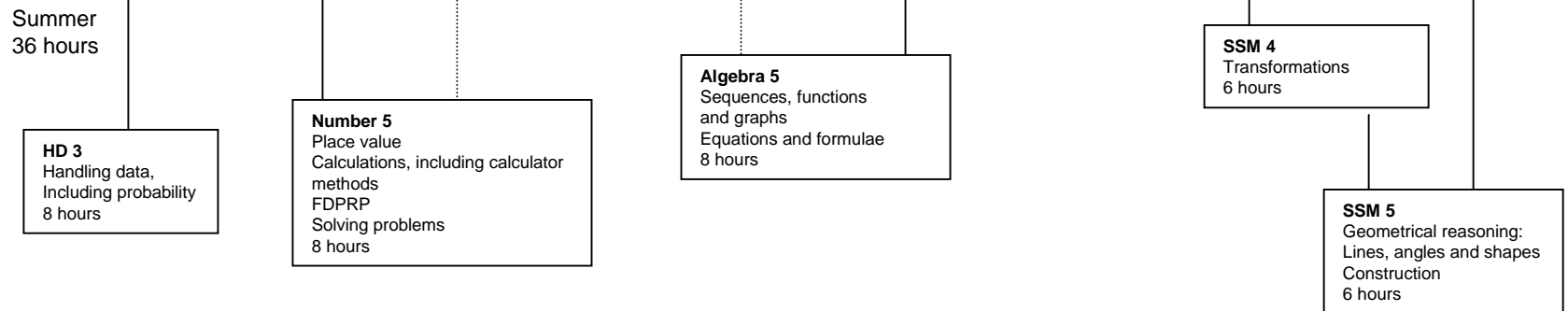
Year 7 planning chart

Number 1
Place value
Integers
Calculations
6 hours

Algebra 1
Sequences and
functions
6 hours

SSM 1
Mensuration
(perimeter and area)
4 hours

Number 2
FDPRP
6 hours

Algebra 2
Equations and
formulae
5 hours

SSM 2
Coordinates
Geometrical reasoning:
lines, angles and
shapes
3 hours

HD 1
Handling data,
including probability
6 hours

Number and measures 3
Place value
Calculations
Calculator methods
Measures
8 hours

Algebra 3
Integers, powers and
roots
Sequences, functions
and graphs
6 hours

HD 2
Handling data
5 hours

Number 2
FDPRP
6 hours

Algebra 4
Equations and
formulae
4 hours

SSM 3
Geometrical reasoning:
Lines, angles and shapes
Construction
5 hours

SSM 4
Transformations
6 hours

Algebra 5
Sequences, functions
and graphs
Equations and formulae
8 hours

HD 3
Handling data,
Including probability
8 hours

Number 5
Place value
Calculations, including calculator
methods
FDPRP
Solving problems
8 hours

SSM 5
Geometrical reasoning:
Lines, angles and shapes
Construction
6 hours

35 weeks

105 hours

Using and applying mathematics to solve problems should be integrated into each unit

YEAR 7: AUTUMN TERM

Teaching objectives for the oral and mental activities

- Read and write whole numbers in figures and words.
- Multiply and divide whole numbers by 10, 100, 1000.
- Count on and back in steps of 0.1, 0.2, 0.25, $^1/_2$, $^1/_4$…
- Round whole numbers to the nearest 10 or 100.
- Order, add and subtract positive and negative numbers in context.
- Recognise multiples and use simple tests of divisibility.
- Know pairs of factors of numbers to 100.
- Know or derive quickly prime numbers less than 30.
- Know or derive quickly squares to at least 12×12 and the corresponding roots.
- Convert between fractions, decimals and percentages.
- Find simple fractions of quantities.

- Know addition and subtraction facts to 20 and whole number complements of 100.
- Find two decimals (one decimal place) with a sum of 1.
- Add and subtract several small numbers or several multiples of 10, e.g. 50 − 40 + 80 − 100.

- Add and subtract pairs of numbers, e.g. 76 ± 38, 760 ± 380.
- Find doubles and halves of numbers, e.g. 670, 5.6.
- Recall multiplication facts to 10×10 and derive associated division facts.
- Multiply and divide a two-digit number by a one-digit number.

- Visualise, describe and sketch 2-D shapes in different orientations.
- Estimate and order acute and obtuse angles.

- Use metric units (length, mass, capacity) and units of time for calculations.
- Use metric units for estimation (length, mass, capacity).
- Convert between m, cm and mm, km and m, kg and g, litres and ml.
- Know rough metric equivalents of common imperial units.

- Apply mental skills to solve simple problems.

Teaching objectives for the main activities

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Algebra 1 (6 hours) Sequences and functions (144–163)	• Recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back. • Know squares to at least 10×10.	• Generate and describe simple integer sequences.	
		• Generate terms of a simple sequence, given a rule (e.g. finding a term from the previous term, finding a term given its position in the sequence).	• Generate terms of a linear sequence using term-to-term and position-to-term definitions of the sequence, on paper and using a spreadsheet or graphical calculator.
		• Generate sequences from practical contexts and describe the general term in simple cases.	• Begin to use linear expressions to describe the nth term of an arithmetic sequence.
		• Express simple functions in words, then using symbols; represent them in mappings.	• Represent mappings expressed algebraically.
Formulae and identities (112–113) Solving problems (32–35)		• **Use letter symbols to represent unknown numbers or variables.** • Suggest extensions to problems by asking 'What if…?'; begin to generalise and to understand the significance of a counter-example.	

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Number 1 (6 hours) Place value (36–41)	• Read and write whole numbers in figures and words. • **Use decimal notation for tenths and hundredths;** know what each digit represents in numbers with up to two decimal places.	• Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect. • Compare and order decimals in different contexts; know that when comparing measurements they must be in the same units.	
Integers (48–51)	• Calculate a temperature rise and fall across 0 °C.	• Understand negative numbers as positions on a number line; order, add and subtract positive and negative integers in context.	• **Add, subtract, multiply and divide integers.**
Calculations (88–91, 102–105)	• Know squares to at least 10 × 10.	• Consolidate the rapid recall of number facts, including positive integer complements to 100 and multiplication facts to 10 × 10, and quickly derive associated division facts.	• Recall known facts, including fraction to decimal conversions; use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8.
	• Use informal pencil and paper methods to support, record or explain additions and subtractions.	• Make and justify estimates and approximations of calculations. • Use standard column procedures to add and subtract whole numbers and decimals with up to two places.	
Calculator methods (108–109) Solving problems (2–11)	• Develop calculator skills and use a calculator effectively.	• Enter numbers and interpret the display in different contexts (decimals, money). • **Solve word problems and investigate in a range of contexts:** number; compare and evaluate solutions.	

Shape, space and measures 1 (4 hours) Mensuration (198–201, 228–231, 234–241)	• Identify different nets for an open cube. • Measure and draw lines to the nearest millimetre. • Record estimates and readings from scales to a suitable degree of accuracy.	• Use 2-D representations to visualise 3-D shapes and deduce some of their properties. • Use names and abbreviations of units of measurement to measure, estimate, calculate and solve problems in everyday contexts involving length, area.	
	• **Understand that area is measured in square centimetres (cm²).** • Understand, measure and calculate perimeters of rectangles and regular polygons.	• Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles.	• Make simple scale drawings. • **Deduce and use formulae for the area of a triangle, parallelogram** and trapezium.
Solving problems (18–21)		• Calculate the surface area of cubes and cuboids. • **Solve word problems and investigate in a range of contexts:** length, perimeter and area.	• **Know and use the formula for the volume of a cuboid.**

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Number 2 (6 hours) Fractions, decimals, percentages (60–77)	• Change an improper fraction to a mixed number; recognise when two simple fractions are equivalent, including relating hundredths to tenths. • **Use decimal notation for tenths and hundredths.**	• Use fraction notation to describe parts of shapes and to express a smaller whole number as a fraction of a larger one; **simplify fractions by cancelling all common factors and identify equivalent fractions;** convert terminating decimals to fractions e.g. $0.23 = {}^{23}/_{100}$; use a diagram to compare two or more simple fractions. • Begin to add and subtract simple fractions and those with common denominators; calculate simple fractions of quantities and measurements (whole-number answers); multiply a fraction by an integer. • Understand percentage as the 'number of parts per 100'; **recognise the equivalence of percentages, fractions and decimals;** calculate simple percentages.	• Know that a recurring decimal is a fraction; use division to convert a fraction to a decimal; order fractions by converting them to decimals. • Calculate fractions of quantities and measurements (fraction answers); multiply and divide an integer by a fraction. • **Find the outcome of a given percentage increase or decrease.**
Calculations (92–101, 110–111)	• Find a difference by counting up through the next multiple of 10, 100 or 1000. • Add and subtract mentally pairs of two-digit numbers.	• Consolidate and **extend mental methods of calculation to include decimals, fractions and percentages,** accompanied where appropriate by suitable jottings; solve simple word problems mentally. • **Check a result by considering whether it is of the right order of magnitude** and by working the problem backwards. • **Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods** and resources, including ICT.	• Recall fraction to decimal conversions.
Solving problems (28–31)		• Present and interpret solutions in the context of the original problem; **explain and justify methods and conclusions,** orally and in writing.	

	SUPPORT	CORE	EXTENSION
Handling data 1 (6 hours) Handling data (256–261, 268–271)		• Calculate statistics for small sets of discrete data: - find the mode, median and range, and the modal class for grouped data; - calculate the mean, including from a simple frequency table, using a calculator for a larger number of items.	• Recognise when it is appropriate to use the range, mean, median and mode; calculate a mean using an assumed mean.
	• **Solve a problem by** representing, **extracting and interpreting data in tables, graphs, charts** and diagrams, for example: - line graphs; - frequency tables and bar charts.	• Interpret diagrams and graphs (including pie charts), and draw conclusions based on the shape of graphs and simple statistics for a single distribution.	
Probability (276–283)		• Use vocabulary and ideas of probability, drawing on experience. • **Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts;** identify all the possible mutually exclusive outcomes of a single event.	• Know that if the probability of an event occurring is p, then the probability of it not occurring is $1 – p$; **find and record all possible mutually exclusive outcomes for two successive events in a systematic way,** using diagrams and tables.
		• Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data.	

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Algebra 2 (5 hours) Equations, formulae and identities (112–119, 138–143)		• **Use letter symbols to represent unknown numbers or variables;** know the meanings of the words *term*, *expression* and *equation*.	• Begin to distinguish the different roles played by letter symbols in equations, formulae and functions; know the meanings of the words *formula* and *function*.
	• Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. Use brackets.	• **Understand that algebraic operations follow the same conventions and order as arithmetic operations.**	• Know that algebraic operations follow the same conventions and order as arithmetic operations; use index notation for small positive integer powers.
		• Simplify linear algebraic expressions by collecting like terms; begin to multiply a single term over a bracket (integer coefficients). • Use simple formulae from mathematics and other subjects, substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.	• **Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.** • **Substitute integers into simple formulae,** including examples that lead to an equation to solve, and positive integers into expressions involving small powers (e.g. $3x^2 + 4$ or $2x^3$).
Solving problems (26–27)		• Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams and tables.	

	SUPPORT	CORE	EXTENSION
Shape, space and measures 2 (3 hours) Geometrical reasoning: lines, angles and shapes (178–189)	• Recognise positions.	• Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes.	
		• **Identify parallel and perpendicular lines; know the sum of angles at a point, on a straight line and in a triangle** and recognise vertically opposite angles.	• **Identify alternate and corresponding angles; understand a proof that:** **- the sum of the angles of a triangle is 180° and of a quadrilateral is 360°;** - the exterior angle of a triangle is equal to the sum of the two interior opposite angles. • Classify quadrilaterals by their geometric properties.
	• **Recognise properties of rectangles.** Classify triangles (isosceles, equilateral, scalene), using criteria such as equal sides, equal angles, lines of symmetry.	• Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals.	
Coordinates (218–219)	• Read and plot coordinates in the first quadrant.	• Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information.	
Mensuration (232–233)		• Use angle measure; distinguish between and estimate the size of acute, obtuse and reflex angles.	

YEAR 7: SPRING TERM

Teaching objectives for the oral and mental activities

- Read and write whole numbers in figures and words.
- Multiply and divide decimals by 10, 100, 1000.
- Count on and back in steps of 0.4, 0.75, $^3/_4$…
- Order decimals in different contexts.
- Round decimals to the nearest whole number.
- Order, add and subtract integers.
- Recognise multiples and use tests of divisibility.
- Know pairs of factors of numbers to 100.
- Know or derive quickly prime numbers less than 30.
- Know or derive quickly squares to at least 12×12 and the corresponding roots.
- Find simple equivalent fractions.

- Know whole-number complements of 50 and 100.
- Find two decimals with a sum of 1 or 0.1 (two decimal places).
- Add several small numbers and find their mean.
- Add and subtract pairs of numbers, e.g. 7.6 ± 3.8, 760 ± 380.

- Find doubles and halves of numbers, e.g. 6500, 0.76, $^3/_4$.
- Recall multiplication and division facts to 10×10.
- Derive answers to calculations, e.g. 60×80, 0.4×9.
- Multiply and divide a two-digit number by a one-digit number.

- Visualise, describe and sketch 2-D shapes.
- Estimate and order acute and obtuse angles.

- Use metric units (length and area) and units of time for calculations.
- Convert between m, cm and mm, km and m.
- Calculate perimeter and area of rectangles.

- Discuss and interpret graphs.

- Apply mental skills to solve simple problems.

Teaching objectives for the main activities

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Handling data 2 (5 hours) Handling data (248–255, 262–265, 268–271) Solving problems (24–25)	• **Solve a problem by** representing, **extracting and interpreting data in tables, graphs, charts** and diagrams. • Solve problems by representing data in a bar chart and line graph.	• Given a problem that can be addressed by statistical methods, suggest possible answers. • Decide which data would be relevant to an enquiry and possible sources. • Plan how to collect and organise small sets of data; design a data collection sheet or questionnaire to use in a simple survey; construct frequency tables for discrete data, grouped where appropriate in equal class intervals. • Collect small sets of data from surveys and experiments, as planned. • Construct, on paper and using ICT, graphs and diagrams to represent data, including: - bar-line graphs; - frequency diagrams for grouped discrete data; use ICT to generate pie charts. • Interpret diagrams and graphs (including pie charts), and draw simple conclusions based on the shape of graphs. • **Solve word problems and investigate in a range of contexts:** handling data.	• Decide the degree of accuracy needed for the data. • Plan how to collect the data, including sample size; construct frequency tables with given equal class intervals for sets of continuous data. • **Construct on paper and using ICT:** **- pie charts for categorical data;** **- simple line graphs for time series.**

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Number and measures 3 (8 hours) Place value (42–45) Calculations (82–87, 92–103, 104–107, 110–111)		• Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.	• Round positive numbers to any given power of 10; round decimals to the nearest whole number or to one or two decimal places.
	• Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws.	• Understand addition, subtraction, multiplication and division as they apply to whole numbers and decimals; know how to use the laws of arithmetic and inverse operations.	
	• Know multiplication facts up to 10 × 10.	• **Know and use the order of operations**, including brackets.	• Recall products such as 0.7 and 6, and 0.03 and 8.
	• Add several numbers. • Use doubling and halving. • Partition to multiply mentally TU × U.	• Consolidate and **extend mental methods of calculation to include decimals, fractions and percentages,** accompanied where appropriate by suitable jottings; solve simple word problems mentally. • Make and justify estimates and approximations of calculations.	
	• **Extend written methods to:** **- HTU × U** and U.t × U; **- TU × TU;** **- HTU ÷ U.** • Divide £.p by a two-digit number to give £.p. • Round up or down after division, depending on the context.	• **Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.**	• **Multiply and divide integers and decimals including by decimals such as 0.6 and 0.06; understand where to position the decimal point by considering equivalent calculations.**
		• **Check a result by considering whether it is of the right order of magnitude** and by working the problem backwards.	
Calculator methods (108–109) Measures (228–231)	• Develop calculator skills and use a calculator effectively. • Use, read and write standard metric units of length, mass and capacity. • Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity.	• Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys. • Use names and abbreviations of units of measurement to measure, estimate, calculate and solve problems in everyday contexts involving length, area, mass, capacity and time; **convert one metric unit to another** (e.g. grams to kilograms); **read and interpret scales on a range of measuring instruments.**	• Know rough metric equivalents of imperial measures in daily use.
Solving problems (28–31)	• **Use all four operations to solve word problems,** including time.	• **Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods** and resources, including ICT. • Present and interpret solutions in the context of the original problem; **explain and justify methods and conclusions,** orally and in writing.	• Give solutions to an appropriate degree of accuracy in the context of the problem.

	SUPPORT From the Y5 and Y6 teaching programmes	**CORE** From the Y7 teaching programme	**EXTENSION** From the Y8 teaching programme
Algebra 3 (6 hours) Integers, powers and roots (52–59) Calculator methods (108–109) Sequences, functions and graphs (148–167) Solving problems (2–13, 26–27)	• Recognise multiples up to 10 × 10; know and apply simple tests of divisibility. • Identify factors of two-digit numbers. • Use a calculator to square numbers. • Recognise and extend number sequences. • Read and plot coordinates in the first quadrant. • Represent and **interpret data in a graph** (e.g. for a multiplication table). • Solve mathematical problems, explaining patterns and relationships.	• Recognise and use multiples, factors (divisors), common factor and primes (less than 100); use simple tests of divisibility. • Recognise the first few triangular numbers, squares of numbers to at least 12 × 12, and the corresponding roots. • Use the square root key. • Generate terms of a simple sequence, given a rule (e.g. finding a term from the previous term, finding a term given its position in the sequence). • Generate sequences from practical contexts and describe the general term in simple cases. • Express simple functions in words, then using symbols; represent them in mappings. • Generate coordinate pairs that satisfy a simple linear rule; **plot the graphs of simple linear functions,** where y is given explicitly in terms of x, on paper and using ICT; recognise straight-line graphs parallel to the x-axis or y-axis. • **Solve word problems and investigate in a range of contexts:** number and algebra. • Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams, tables and graphs.	• Find the prime factor decomposition of a number. • Use squares, and positive and negative square roots. • Use the function keys for sign change, powers and roots. • Generate terms of a linear sequence using term-to-term and position-to-term definitions, on paper and using a spreadsheet or graphical calculator. • Begin to use linear expressions to describe the nth term of an arithmetic sequence. • Express simple functions in symbols; represent mappings expressed algebraically. • Generate points in all four quadrants and **plot the graphs of linear functions; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs.** • Solve more complex problems by breaking them into smaller steps. • **Represent problems and interpret solutions in algebraic or graphical form,** using correct notation.

Shape, space and measures 3 (5 hours)
Geometrical reasoning: lines, angles and shapes
(184–189, 198–201)
 	
Construction
(220–223)
	• Recognise reflection symmetry.
	• Recognise where a shape will be after reflection.
	• Recognise where a shape will be after a translation.
	• Calculate angles on a straight line.
	• Calculate angles in a triangle or around a point.
	
	• **Use a protractor to measure** and draw **acute and obtuse angles to the nearest degree.**
		• Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals; solve geometrical problems involving these properties, using step-by-step deduction and explaining reasoning with diagrams and text.
		
		• Use 2-D representations to visualise 3-D shapes and deduce some of their properties.
		• Use a ruler and protractor to:
		  - measure and draw lines to nearest millimetre and angles, including reflex angles, to the nearest degree;
		  - construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA);
		explore these constructions using ICT.
			• Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals.
			
			• **Use straight edge and compasses to construct:**
			  - the mid-point and perpendicular bisector of a line segment;
			  - the bisector of an angle;
			construct a triangle given three sides (SSS).

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Number 4 (5 hours) Fractions, decimals, percentages, ratio and proportion (70–81) Calculations (110–111)	• **Relate fractions to division.** • Find simple fractions of whole-number quantities. • Find simple percentages of whole-number quantities. • Solve simple problems using ideas of ratio and proportion ('one for every…' and 'one in every…').	• **Recognise the equivalence of percentages, fractions and decimals;** calculate simple percentages and use percentages to compare simple proportions. • Understand the relationship between ratio and proportion; use direct proportion in simple contexts; use ratio notation, reduce a ratio to its simplest form and divide a quantity into two parts in a given ratio; solve simple problems about ratio and proportion using informal strategies. • **Check a result by considering whether it is of the right order of magnitude** and by working the problem backwards.	• Express one given number as a percentage of another; **use the equivalence of fractions, decimals and percentages to compare proportions.** • **Divide a quantity into two or more parts in a given ratio; use the unitary method to solve simple word problems involving ratio and direct proportion.**
Algebra 4 (4 hours) Equations, formulae and identities (112–125)	• Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. Use brackets.	• **Use letter symbols to represent unknown numbers or variables;** know the meanings of the words *term*, *expression* and *equation*. • **Understand that algebraic operations follow the same conventions and order as arithmetic operations.** • Simplify linear algebraic expressions by collecting like terms; begin to multiply a single term over a bracket (integer coefficients). • Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations).	• Begin to distinguish between the different roles played by letter symbols in equations, formulae and functions; know the meanings of the words *formula* and *function*. • Construct and solve linear equations with integer coefficients (unknown on either or both sides, without and with brackets) using appropriate methods (e.g. inverse operations, transforming both sides in the same way).

YEAR 7: SUMMER TERM

Teaching objectives for the oral and mental activities

- Multiply and divide decimals by 10, 100, 1000 and small multiples of 10.
- Round numbers, including to one or two decimal places.
- Order decimals and simple fractions in different contexts.
- Recognise multiples and use tests of divisibility.
- Know pairs of factors of numbers to 100.
- Know or derive quickly prime numbers less than 30.
- Know or derive squares to at least 12×12, multiples of 10, 0.1 to 0.9 and corresponding square roots.
- Convert between fractions, decimals and percentages.
- Find fractions and percentages of quantities.

- Know complements of 0.1, 1, 10, 50, 100.
- Add and subtract pairs of numbers, e.g. 0.65 + 3.8, 765 + 47.
- Use jottings to support addition and subtraction of whole numbers and decimals.
- Find doubles and halves of decimals and fractions.
- Recall multiplication and division facts to 10×10.
- Use doubling and halving to calculate, e.g. 6×4.5, 1.38×50.

- Use factors to multiply and divide mentally, e.g. 35×12, $144 \div 36$, 3.2×30.
- Derive answers to calculations, e.g. 0.4×9, 0.7×0.9.
- Multiply and divide a two-digit number by a one-digit number.
- Use approximations to estimate the answers to calculations, e.g. 39×2.8.

- Solve equations such as $100 = x + 37$.

- Visualise and describe 2-D and 3-D shapes.
- Estimate and order acute, obtuse and reflex angles.

- Use metric units (length, mass, capacity) and units of time for calculations.
- Convert between m, cm and mm, km and m, kg and g, litres and ml.
- Convert between metric and common imperial units.

- Discuss and interpret graphs.

- Apply mental skills to solve simple problems.

Teaching objectives for the main activities

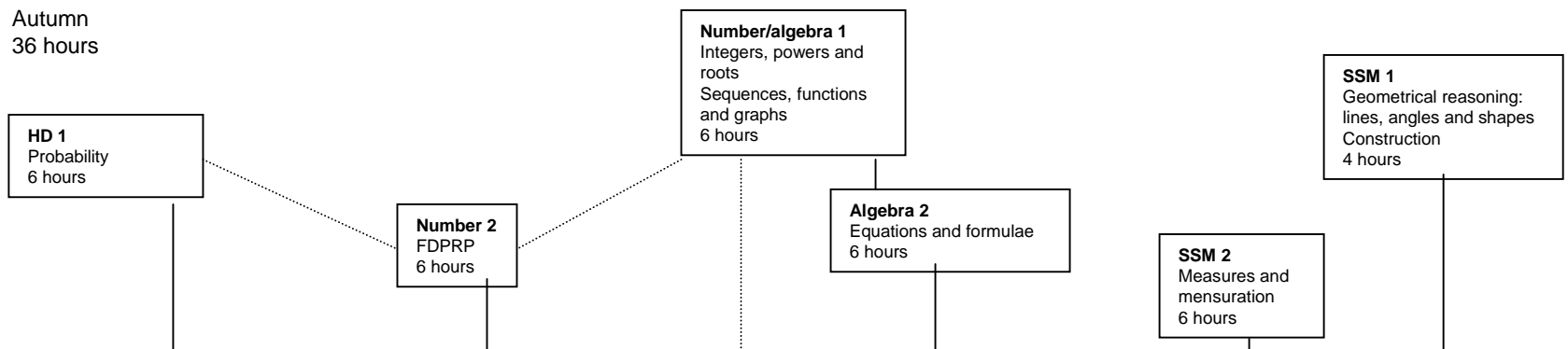|	**SUPPORT** From the Y5 and Y6 teaching programmes	**CORE** From the Y7 teaching programme	**EXTENSION** From the Y8 teaching programme
Shape, space and measures 4 (6 hours) Transformations (202–212)		• Understand and use the language and notation associated with reflections, translations and rotations.	
	• Recognise reflection symmetry. • Recognise where a shape will be after reflection. • Recognise where a shape will be after a translation.	• Recognise and visualise the transformation and symmetry of a 2-D shape: - reflection in given mirror lines, and line symmetry; - rotation about a given point, and rotation symmetry; - translation; explore these transformations and symmetries using ICT.	• Transform 2-D shapes by simple combinations of rotations, reflections and translations, on paper and using ICT; identify all the symmetries of 2-D shapes.
			• Understand and use the language and notation associated with enlargement; **enlarge 2-D shapes, given a centre of enlargement and a positive whole-number scale factor.**
Solving problems (14–17, 32–35)		• **Solve word problems and investigate in a range of contexts:** shape and space. • Suggest extensions to problems by asking 'What if...?'; begin to generalise and to understand the significance of a counter-example.	

	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Handling data 3 (8 hours) Handling data (250–273)		• Decide which data would be relevant to an enquiry and possible sources. • Plan how to collect and organise small sets of data; design a data collection sheet or questionnaire to use in a simple survey; construct frequency tables for discrete data, grouped where appropriate in equal class intervals.	

	• Find the mode and range of a set of data.
	• Begin to find the median and the mean of a set of data.
		• Calculate statistics for small sets of discrete data:
		  - find the mode, median and range, and the modal class for grouped data;
		  - calculate the mean, including from a simple frequency table, using a calculator for a larger number of items.
		• Construct, on paper and using ICT, graphs and diagrams to represent data, including:
		  - bar-line graphs;
		  - frequency diagrams for grouped discrete data;
		  use ICT to generate pie charts.
			• Recognise when it is appropriate to use the range, mean, median and mode and, for grouped data, the modal class; calculate a mean using an assumed mean.
			• **Construct on paper and using ICT:**
			  - pie charts for categorical data;
			  - simple line graphs for time series.

	• **Solve a problem by** representing, **extracting and interpreting data in tables, graphs and charts.**	• Interpret diagrams and graphs (including pie charts), and draw conclusions based on the shape of graphs and simple statistics for a single distribution. • **Compare two simple distributions using the range and one of the mode, median or mean.** • Write a short report of a statistical enquiry and illustrate with appropriate diagrams, graphs and charts, using ICT as appropriate; justify the choice of what is presented.	• Interpret tables, graphs and diagrams for both discrete and continuous data.
Probability (278–285)		• **Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts;** identify all the possible mutually exclusive outcomes of a single event.	• Know that if the probability of an event occurring is p, then the probability of it not occurring is $1 - p$; **find and record all possible mutually exclusive outcomes for two successive events in a systematic way,** using diagrams and tables.

		• Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data.	• Understand that:
			  - if an experiment is repeated there may be, and usually will be, different outcomes;
			  - increasing the number of times an experiment is repeated generally leads to better estimates of probability.

		• Compare experimental and theoretical probabilities in simple contexts.	

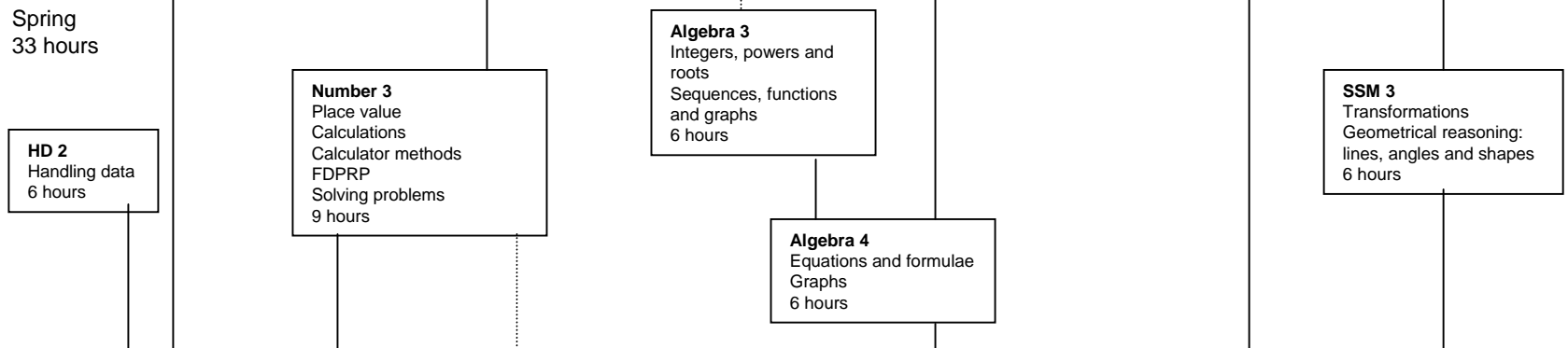|	SUPPORT From the Y5 and Y6 teaching programmes	CORE From the Y7 teaching programme	EXTENSION From the Y8 teaching programme
Number 5 (8 hours) Place value (52–55) Calculations (88–107, 110–111)	• Recognise multiples up to 10 × 10; know simple tests of divisibility. • Identify factors of two-digit numbers.	• Recognise and use multiples, factors (divisors), common factor, highest common factor and lowest common multiple in simple cases, and primes (less than 100); use simple tests of divisibility. • Consolidate the rapid recall of number facts, including positive integer complements to 100 and multiplication facts to 10 × 10, and quickly derive associated division facts.	• Find the prime factor decomposition of a number. • Recall known facts, including fraction to decimal conversions; use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8.
	• Consolidate mental methods: - find a difference by counting up; - add or subtract a multiple of 10 then adjust. • Add and subtract mentally pairs of two-digit numbers.	• Consolidate and **extend mental methods to include decimals, fractions and percentages,** accompanied where appropriate by suitable jottings; solve simple word problems mentally.	• Extend mental calculations to squares and square roots, cubes and cube roots.
		• Make and justify estimates and approximations of calculations. • Use standard column procedures to add and subtract whole numbers and decimals with up to two places.	
	• Approximate first and use informal pencil and paper methods to EXTENSION addition and subtraction. • **Extend written methods to:** **- ThHTU × U and U.t × U;** **- TU × TU;** **- HTU ÷ U.** • Divide £.p by a two-digit number to give £.p. • Round up or down after division, depending on context.	• **Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.**	• **Multiply and divide integers and decimals, including by decimals such as 0.6 and. 0.06; understand where to position the decimal point by considering equivalent calculations.**
Calculator methods (108–109)		• **Check a result by considering whether it is of the right order of magnitude** and by working the problem backwards. • Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys. • Interpret the display of a calculator in different contexts (decimals, percentages).	
Fractions and percentages (66–77)		• Calculate simple fractions of quantities and measurements (whole-number answers); multiply a fraction by an integer.	• Calculate fractions of quantities and measurements (fraction answers); multiply and divide an integer by a fraction.
Solving problems (28–29)		• **Recognise the equivalence of percentages, fractions and decimals;** calculate simple percentages and use percentages to compare simple proportions. • **Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods** and resources, including ICT.	

	SUPPORT From the Y5 and Y6 teaching programmes	**CORE** From the Y7 teaching programme	**EXTENSION** From the Y8 teaching programme
Algebra 5 (8 hours) Equations, formulae and identities (122–143)		• Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations).	• Construct and solve linear equations with integer coefficients (unknown on either or both sides, without and with brackets) using appropriate methods (e.g. inverse operations, transforming both sides in the same way).
	• Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. Use brackets.	• Use simple formulae from mathematics and other subjects, substitute positive integers in simple linear expressions and formulae and, in simple cases, derive a formula.	• **Substitute integers into simple formulae,** including examples that lead to an equation to solve, and positive integers into expressions involving small powers (e.g. $3x^2 + 4$ or $2x^3$).
Sequences, functions and graphs (154–177)		• Generate sequences from practical contexts and describe the general term in simple cases.	• Begin to use linear expressions to describe the nth term of an arithmetic sequence.
		• Express simple functions (in words, then) using symbols; represent them in mappings.	
	• **Read and plot coordinates in all four quadrants.**	• Generate coordinate pairs that satisfy a simple linear rule; **plot the graphs of simple linear functions**, where y is given explicitly in terms of x, on paper and using ICT; recognise straight-line graphs parallel to the x-axis or y-axis.	• Generate points in all four quadrants and **plot the graphs of linear functions; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs.**
		• Begin to plot and interpret the graphs of simple linear functions arising from real-life situations.	
Solving problems (32–35)		• Suggest extensions to problems by asking 'What if…?'; begin to generalise and to understand the significance of a counter-example.	

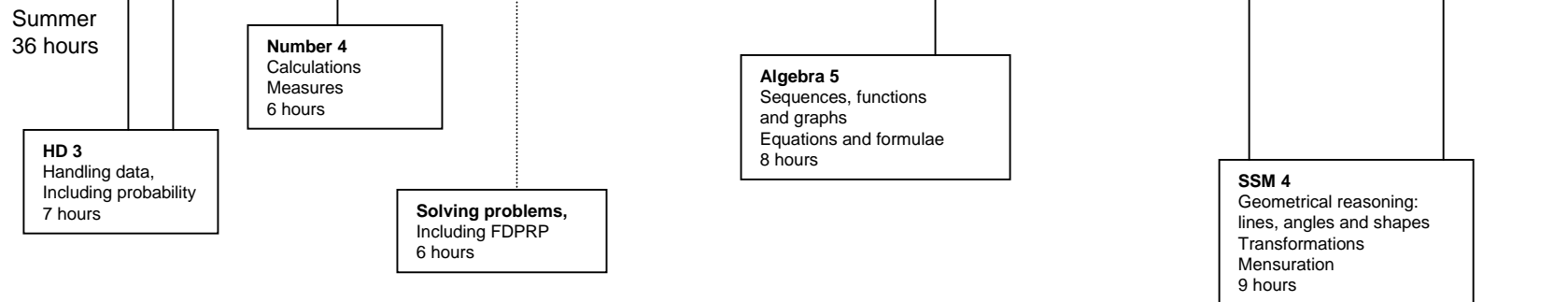|	**SUPPORT**	**CORE**	**EXTENSION**
Shape, space and measures 5 (6 hours) Geometrical reasoning: lines, angles and shapes (184–212)	• Recognise reflection symmetry. • Recognise where a shape will be after reflection. • Recognise where a shape will be after a translation. • Calculate angles on a straight line, in a triangle, or around a point.	• Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals; solve geometrical problems involving these properties, using step-by-step deduction and explaining reasoning with diagrams and text.	• Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals. • Classify quadrilaterals by their geometric properties.
Construction (220–223)	• **Use a protractor to measure** and draw **acute and obtuse angles to the nearest degree.**	• Explore transformations and symmetries using ICT. • Use a ruler and protractor to: - construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA); explore these constructions using ICT.	• **Use straight edge and compasses to construct: - the mid-point and perpendicular bisector of a line segment; - the bisector of an angle;** construct a triangle given three sides (SSS).
	• Visualise 3-D shapes from 2-D drawings and identify different nets for a closed cube.	• Use a ruler and protractor to construct simple nets of 3-D shapes, e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism.	

Year 8 planning chart

Autumn
36 hours

HD 1
Probability
6 hours

Number/algebra 1
Integers, powers and roots
Sequences, functions and graphs
6 hours

SSM 1
Geometrical reasoning: lines, angles and shapes
Construction
4 hours

Number 2
FDPRP
6 hours

Algebra 2
Equations and formulae
6 hours

SSM 2
Measures and mensuration
6 hours

Spring
33 hours

HD 2
Handling data
6 hours

Number 3
Place value
Calculations
Calculator methods
FDPRP
Solving problems
9 hours

Algebra 3
Integers, powers and roots
Sequences, functions and graphs
6 hours

SSM 3
Transformations
Geometrical reasoning: lines, angles and shapes
6 hours

Algebra 4
Equations and formulae
Graphs
6 hours

Summer
36 hours

Number 4
Calculations
Measures
6 hours

Algebra 5
Sequences, functions and graphs
Equations and formulae
8 hours

HD 3
Handling data,
Including probability
7 hours

Solving problems,
Including FDPRP
6 hours

SSM 4
Geometrical reasoning: lines, angles and shapes
Transformations
Mensuration
9 hours

35 weeks

105 hours

Using and applying mathematics to solve problems should be integrated into each unit

YEAR 8: AUTUMN TERM

Teaching objectives for the oral and mental activities

• Order, add, subtract, multiply and divide integers. • Multiply and divide decimals by 10, 100, 1000. • Count on and back in steps of 0.4, 0.75, $3/4$… • Round numbers, including to one or two decimal places. • Know and use squares, positive and negative square roots, cubes of numbers 1 to 5 and corresponding roots. • Convert between fractions, decimals and percentages. • 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. • Calculate using knowledge of multiplication and division facts and place value, e.g. 432×0.01, $37 \div 0.01$. • Recall multiplication and division facts to 10×10. • Use factors to multiply and divide mentally, e.g. 22×0.02, $420 \div 15$.	• Multiply and divide a two-digit number by a one-digit number. • Use partitioning to multiply, e.g. 13×1.4. • Use approximations to estimate the answers to calculations, e.g. 39×2.8. • Solve equations, e.g. $3a - 2 = 31$. • Visualise, describe and sketch 2-D shapes. • 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 m, cm and mm, km and m, kg and g, litres and ml, cm^2 and mm^2. • Discuss and interpret graphs. • Apply mental skills to solve simple problems.

Teaching objectives for the main activities

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Number/algebra 1 (6 hours) Integers, powers and roots (48–59)	• Understand negative numbers as positions on a number line; order, add and subtract positive and negative integers in context. • Use simple tests of divisibility.	• **Add, subtract, multiply and divide integers.** • Recognise and use multiples, factors (divisors), common factor, highest common factor, lowest common multiple and primes; find the prime factor decomposition of a number (e.g. $8000 = 2^6 \times 5^3$).	• Use the prime factor decomposition of a number.
	• Recognise the first few triangular numbers, squares of numbers to at least 12×12 and the corresponding roots.	• Use squares, positive and negative square roots, cubes and cube roots, and index notation for small positive integer powers.	• Use ICT to estimate square roots and cube roots. • Use index notation for integer powers and simple instances of the index laws.
Sequences and functions (144–157)	• Generate terms of a simple sequence given a rule. • Generate sequences from practical contexts and describe the general term in simple cases.	• Generate and describe integer sequences. • Generate terms of a linear sequence using term-to-term and position-to-term definitions of the sequence, on paper and using a spreadsheet or graphical calculator. • Begin to use linear expressions to describe the *n*th term of an arithmetic sequence, justifying its form by referring to the activity or practical context from which it was generated.	

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Shape, space and measures 1 (6 hours) Geometrical reasoning: lines, angles and shapes (178–189)	• Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes. • **Identify parallel and perpendicular lines; know the sum of angles at a point, on a straight line and in a triangle,** and recognise vertically opposite angles. • Use angle measure; distinguish between and estimate the size of acute, obtuse and reflex angles.	• **Identify alternate angles and corresponding angles; understand a proof that:** - **the sum of the angles of a triangle is 180° and of a quadrilateral is 360°;** - the exterior angle of a triangle is equal to the sum of the two interior opposite angles. • Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometric properties.	• Explain how to find, calculate and use: - the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; - the interior and exterior angles of regular polygons. • **Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons.** • Know the definition of a circle and the names of its parts. • Use straight edge and compasses to construct a triangle, given right angle, hypotenuse and side (RHS).
Construction (220–223)	• Use a ruler and protractor to: - measure and draw lines to the nearest millimetre and angles, including reflex angles, to the nearest degree; - construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA).	• **Use straight edge and compasses to construct:** - **the mid-point 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.**	
Solving problems (14–17)		• Investigate in a range of contexts: shape and space.	

Handling data 1 (6 hours) Probability (276--283)	• **Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts.** • Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data.	• Use the vocabulary of probability when interpreting the results of an experiment; appreciate that random processes are unpredictable. • Know that if the probability of an event occurring is p, then the probability of it not occurring is $1 - p$; **find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way,** using diagrams and tables. • Estimate probabilities from experimental data; understand that: - if an experiment is repeated there may be, and usually will be, different outcomes; - increasing the number of times an experiment is repeated generally leads to better estimates of probability.	• Identify all the mutually exclusive outcomes of an experiment; **know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems.** • Compare experimental and theoretical probabilities in a range of contexts; appreciate the difference between mathematical explanation and experimental evidence.

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Number 2 (6 hours) Fractions, decimals, percentages (60–77) Calculations (82–85, 88–101)	• Use fraction notation to express a smaller whole number as a fraction of a larger one; **simplify fractions by cancelling all common factors and identify equivalent fractions;** convert terminating decimals to fractions. • Add and subtract fractions with common denominators; calculate fractions of quantities (whole-number answers); multiply a fraction by an integer. • Understand percentage as the 'number of parts per 100'; calculate simple percentages. • Consolidate the rapid recall of number facts, including positive integer complements to 100 and multiplication facts to 10×10, and quickly derive associated division facts.	• Know that a recurring decimal is a fraction; use division to convert a fraction to a decimal; order fractions by writing them with a common denominator or by converting them to decimals. • Add and subtract fractions by writing them with a common denominator; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction. • Interpret percentage as the operator 'so many hundredths of' and express one given number as a percentage of another; **use the equivalence of fractions, decimals and percentages to compare proportions; calculate percentages and find the outcome of a given percentage increase or decrease.** • Understand addition and subtraction of fractions; use the laws of arithmetic and inverse operations. • Recall known facts, including fraction to decimal conversions; use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8. • Consolidate and extend mental methods of calculation, working with decimals, fractions and percentages; solve word problems mentally.	• Use efficient methods to **add, subtract, multiply and divide fractions,** interpreting division as a multiplicative inverse; cancel common factors before multiplying or dividing. • Solve problems involving percentage changes. • Use known facts to derive unknown facts. • Extend mental methods of calculation, working with factors, powers and roots.

Algebra 2 (6 hours) Equations and formulae (112–119, 138–143)	• **Use letter symbols to represent unknown numbers or variables;** know the meanings of the words *term*, *expression* and *equation*. • Simplify linear algebraic expressions by collecting like terms.	• Begin to distinguish the different roles played by letter symbols in equations, formulae and functions; know the meanings of the words *formula* and *function*. • Know that algebraic operations follow the same conventions and order as arithmetic operations; use index notation for small positive integer powers. • **Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.** • Use formulae from mathematics and other subjects; **substitute integers into simple formulae,** and positive integers into expressions involving small powers (e.g. $3x^2 + 4$ or $2x^3$); derive simple formulae.	• Use index notation for integer powers and simple instances of the index laws. • Simplify or transform algebraic expressions by taking out single term common factors.

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Shape, space and measures 2 (6 hours) Measures and mensuration (228–231, 234–241) Solving problems (18–21)	• **Convert one metric unit to another** (e.g. grams to kilograms); **read and interpret scales on a range of measuring instruments.** • Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles. • Calculate the surface area of cubes and cuboids.	• Use units of measurement to estimate, calculate and solve problems in everyday contexts involving length, area, volume, capacity, mass, time and angle; know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons). • **Deduce and use formulae for the area of a triangle, parallelogram** and trapezium; calculate areas of compound shapes made from rectangles and triangles. • **Know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids** and shapes made from cuboids. • Investigate in a range of contexts: measures.	• Convert between area measures (mm^2 to cm^2, cm^2 to m^2, and vice versa) and between volume measures (mm^3 to cm^3, cm^3 to m^3, and vice versa). • **Know and use the formulae for the circumference and area of a circle.** • Calculate the surface area and volume of right prisms.

YEAR 8: SPRING TERM

Teaching objectives for the oral and mental activities

• Order, add, subtract, multiply and divide integers. • Round numbers, including to one or two decimal places. • Know and use squares, positive and negative square roots, cubes of numbers 1 to 5 and corresponding roots. • Know or derive quickly prime numbers less than 30. • Convert between improper fractions and mixed numbers. • Find the outcome of a given percentage increase or decrease. • Know 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. • Calculate using knowledge of multiplication and division facts and place value, e.g. 432×0.01, $37 \div 0.01$, 0.04×8, $0.03 \div 5$. • Recall multiplication and division facts to 10×10. • Use factors to multiply and divide mentally, e.g. 22×0.02, $420 \div 15$. • Multiply and divide a two-digit number by a one-digit number. • Multiply by near 10s, e.g. 75×29, $8 \times {}^-19$. • Use partitioning to multiply, e.g. 13×1.4.	• Use approximations to estimate the answers to calculations, e.g. 39×2.8. • Solve equations, e.g. $n(n - 1) = 56$. • Visualise, describe and sketch 2-D shapes, 3-D shapes and simple loci. • Estimate and order acute, obtuse and reflex angles. • Use metric units (length, area and volume) and units of time for calculations. • Use metric units for estimation (length, area and volume). • Recall and use the formula for perimeter of rectangles and calculate areas of rectangles and triangles. • Calculate volumes of cuboids. • Discuss and interpret graphs. • Apply mental skills to solve simple problems.

Teaching objectives for the main activities

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Algebra 3 (6 hours) Sequences, functions, graphs (160–177)	• Express simple functions in words. • Generate coordinate pairs that satisfy a simple linear rule; recognise straight-line graphs parallel to the *x*-axis or *y*-axis.	• Express simple functions in symbols; represent mappings expressed algebraically. • Generate points in all four quadrants and **plot the graphs of linear functions, where *y* is given explicitly in terms of *x*,** on paper and using ICT; **recognise that equations of the form *y = mx + c* correspond to straight-line graphs.** • Construct linear functions arising from real-life problems and plot their corresponding graphs; discuss and interpret graphs arising from real situations.	• Find the inverse of a linear function. • Plot graphs of linear functions (*y* given implicitly in terms of *x*), e.g. $ay + bx = 0$, $y + bx + c = 0$, on paper and using ICT; **given values for *m* and *c*, find the gradient of lines given by equations of the form *y = mx + c*.** • Discuss and interpret distance–time graphs.

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Number 3 (9 hours) Place value (36–47)	• Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100 and 1000, and explain the effect.	• Read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01. • Order decimals.	• Extend knowledge of integer powers of 10; multiply and divide by any integer power of 10.
	• Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.	• Round positive numbers to any given power of 10; round decimals to the nearest whole number or to one or two decimal places.	
Calculations (92–107, 110–111)	• Consolidate and **extend mental methods of calculation to include decimals, fractions and percentages,** accompanied where appropriate by suitable jottings.	• Consolidate and extend mental methods of calculation, working with decimals, squares and square roots, cubes and cube roots; solve word problems mentally.	• Extend mental methods of calculation, working with decimals, fractions, percentages, factors, powers and roots.
		• Make and justify estimates and approximations of calculations. • Consolidate standard column procedures for addition and subtraction of integers and decimals with up to two places.	• 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 three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.**	• **Use standard column procedures for multiplication and division of integers and decimals, including by decimals such as 0.6 or 0.06; understand where to position the decimal point by considering equivalent calculations.**	• Multiply and divide by decimals, dividing by transforming to division by an integer.
		• Check a result by considering whether it is of the right order of magnitude and by working the problem backwards	
Calculator methods (108--109)	• Carry out calculations with more than one step using brackets and the memory.	• Carry out more difficult calculations effectively and efficiently using the function keys of a calculator for sign change, powers, roots and fractions; use brackets and the memory.	• Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation.
		• Enter numbers and interpret the display of a calculator in different contexts (negative numbers, fractions, decimals, percentages, money, metric measures, time).	

	SUPPORT From the Y7 teaching programme	**CORE** From the Y8 teaching programme	**EXTENSION** From the Y9 teaching programme
Shape, space and measures 3 (6 hours) Geometrical reasoning: lines, angles and shapes (190–191) Transformations (202–215)		• Know that if two 2-D shapes are congruent, corresponding sides and angles are equal.	
	• Recognise and visualise the transformation and symmetry of a 2-D shape: - reflection in given mirror lines, and line symmetry; - rotation about a given point, and rotation symmetry; - translation; explore these transformations and symmetries using ICT.	• Transform 2-D shapes by simple combinations of rotations, reflections and translations, on paper and using ICT; identify all the symmetries of 2-D shapes.	• **Know that translations, rotations and reflections preserve length and angle and map objects on to congruent images;** identify reflection symmetry in 3-D shapes.
		• Understand and use the language and notation associated with enlargement; **enlarge 2-D shapes, given a centre of enlargement and a positive whole-number scale factor;** explore enlargement using ICT.	• Enlarge 2-D shapes, given a centre of enlargement and a negative whole-number scale factor, on paper; 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.
Ratio and proportion (78–81)	• Understand the relationship between ratio and proportion; solve simple problems about ratio and proportion using informal strategies.	• Consolidate understanding of the relationship between ratio and proportion; reduce a ratio to its simplest form, including a ratio expressed in different units, recognising links with fraction notation.	• **Use proportional reasoning to solve a problem;** interpret and use ratio in a range of contexts.
Algebra 4 (6 hours) Equations and formulae (112–113, 122–125, 138–143)	• **Use letter symbols to represent unknown numbers or variables;** know the meanings of the words *term*, *expression* and *equation*. • Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations).	• Begin to distinguish the different roles played by letter symbols in equations, formulae and functions; know the meanings of the words *formula* and *function*. • Construct and solve linear equations with integer coefficients (unknown on either or both sides, without and with brackets) using appropriate methods (e.g. inverse operations, transforming both sides in the same way).	• **Construct and solve linear equations with integer coefficients** (with and without brackets, negative signs anywhere in the equation, positive or negative solution), **using an appropriate method.**
		• Use formulae from mathematics and other subjects; **substitute integers into simple formulae,** including examples that lead to an equation to solve; derive simple formulae.	• Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject.

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Handling data 2 (6 hours) Handling data (248–273)	• Given a problem that can be addressed by statistical methods, suggest possible answers.	• Discuss a problem that can be addressed by statistical methods and identify related questions to explore. • Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources.	• Discuss how data relate to a problem; identify possible sources, including primary and secondary sources.
	• Design a data collection sheet or questionnaire to use in a simple survey; construct frequency tables for discrete data.	• Plan how to collect the data, including sample size; design and use two-way tables for discrete data. • Collect data using a suitable method, such as observation, controlled experiment using ICT, or questionnaire.	• Gather data from specified secondary sources, including printed tables and lists from ICT-based sources.
	• Calculate statistics for small sets of discrete data: - find the mode, median and range; - calculate the mean, including from a simple frequency table, using a calculator for a larger number of items. • Construct, on paper and using ICT, graphs and diagrams to represent data, including: - bar-line graphs; use ICT to generate pie charts.	• Calculate statistics, including with a calculator; recognise when it is appropriate to use the range, mean, median and mode; construct and use stem-and-leaf diagrams. • **Construct, on paper and using ICT:** **- pie charts for categorical data;** **- bar charts and frequency diagrams for discrete data;** **- simple scatter graphs;** **identify which are most useful in the context of the problem**. • Interpret tables, graphs and diagrams for discrete data and draw inferences that relate to the problem being discussed; relate summarised data to the questions being explored.	• Interpret graphs and diagrams and draw inferences to support or cast doubt on initial conjectures; have a basic understanding of correlation.
	• Write a short report of a statistical enquiry and illustrate with appropriate diagrams, graphs and charts, using ICT as appropriate; justify choice of what is presented.	• Communicate orally and on paper the results of a statistical enquiry and the methods used, using ICT as appropriate; justify the choice of what is presented.	
Solving problems (28–29)		• Solve more complex problems by breaking them into smaller steps or tasks, choosing and using resources, including ICT.	

YEAR 8: SUMMER TERM

Teaching objectives for the oral and mental activities

• Order, add, subtract, multiply and divide integers. • Multiply and divide decimals by 10, 100, 1000, 0.1, 0.01. • Round numbers, including to one or two decimal places. • Know and use squares, cubes, roots and index notation. • Know or derive prime factorisation of numbers to 30. • Convert between fractions, decimals and percentages. • Find the outcome of a given percentage increase or decrease. • Know complements of 0.1, 1, 10, 50, 100. • 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. • Calculate using knowledge of multiplication and division facts and place value, e.g. 432×0.01, $37 \div 0.01$, 0.04×8, $0.03 \div 5$. • Recall multiplication and division facts to 10×10. • Use factors to multiply and divide mentally, e.g. 22×0.02, $420 \div 15$. • Multiply by near 10s, e.g. 75×29, $8 \times {}^{-}19$.	• Use partitioning to multiply, e.g. 13×1.4. • Use approximations to estimate the answers to calculations, e.g. 39×2.8. • Solve equations, e.g. $n(n − 1) = 56$, ❣ + ❣ = ${}^{-}46$. • Visualise, describe and sketch 2-D shapes, 3-D shapes and simple loci. • Estimate and order acute, obtuse and reflex angles. • 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 m, cm and mm, km and m, kg and g, litres and ml, cm^2 and mm^2. • Discuss and interpret graphs. • Calculate a mean using an assumed mean. • Apply mental skills to solve simple problems.

Teaching objectives for the main activities

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Number 4 (6 hours) Calculations (82–87, 92–107, 110–111)		• Understand addition and subtraction of fractions and integers, and multiplication and division of integers; use the laws of arithmetic and inverse operations. • Use the order of operations, including brackets, with more complex calculations.	• **Understand the effects of multiplying and dividing by numbers between 0 and 1.** • Understand the order of precedence and effect of powers.
	• Consolidate and **extend mental methods of calculation to include decimals, fractions and percentages,** accompanied where appropriate by suitable jottings.	• Consolidate and extend mental methods of calculation, working with decimals, fractions and percentages, squares and square roots, cubes and cube roots; solve word problems mentally. • Make and justify estimates and approximations of calculations. • Consolidate standard column procedures for addition and subtraction of integers and decimals with up to two places.	• Extend mental methods of calculation, working with decimals, fractions, percentages, factors, powers and roots. • Use standard column procedures to add and subtract integers and decimals of any size.
	• **Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.**	• **Use standard column procedures for multiplication and division of integers and decimals, including by decimals such as 0.6 or 0.06; understand where to position the decimal point by considering equivalent calculations.** • Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.	• Multiply and divide by decimals, dividing by transforming to division by an integer.
Measures (228–231)	• **Convert one metric unit to another** (e.g. grams to kilograms).	• Use units of measurement to estimate, calculate and solve problems in everyday contexts.	

	SUPPORT From the Y7 teaching programme	**CORE** From the Y8 teaching programme	**EXTENSION** From the Y9 teaching programme
Algebra 5 (8 hours) Equations and formulae (116–137)	• Simplify linear algebraic expressions by collecting like terms. • Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations).	• **Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.** • Construct and solve linear equations with integer coefficients (unknown on either or both sides, without and with brackets) using appropriate methods (e.g. inverse operations, transforming both sides in the same way). • Begin to use graphs and set up equations to solve simple problems involving direct proportion.	• Simplify or transform algebraic expressions by taking out single term common factors. • **Construct and solve linear equations with integer coefficients** (with and without brackets, negative signs anywhere in the equation, positive or negative solution), **using an appropriate method.** • Use systematic trial and improvement methods and ICT tools to find approximate solutions of equations such as $x^3 + x = 20$. • Solve problems involving direct proportion using algebraic methods, relating algebraic solutions to graphical representations of the equations; use ICT as appropriate.
Sequences, functions and graphs (164–177)	• Generate coordinate pairs that satisfy a simple linear rule; recognise straight-line graphs parallel to the *x*-axis or *y*-axis.	• **Plot the graphs of linear functions, where *y* is given explicitly in terms of *x*,** on paper and using ICT. • Construct linear functions arising from real-life problems and plot their corresponding graphs; discuss and interpret graphs arising from real situations. • Solve more demanding problems and investigate in a range of contexts: algebra.	• Plot graphs of linear functions (*y* given implicitly in terms of *x*), e.g. $ay + bx = 0$, $y + bx + c = 0$, on paper and using ICT.
Solving problems (6–13, 28–29)	• **Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods** and resources, including ICT.	• Solve more complex problems by breaking them into smaller steps or tasks, choosing and using efficient techniques for algebraic manipulation.	• Use trial and improvement methods where a more efficient method is not obvious.

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Solving problems (6 hours) Solving problems (2–35)		• Solve more demanding problems and investigate in a range of contexts: number and measures. • **Identify the necessary information to solve a problem; represent problems and interpret solutions in algebraic or graphical form,** using correct notation.	
	• Represent problems mathematically, making correct use of symbols, words, diagrams, tables and graphs. • **Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods** and resources, including ICT.	• Solve more complex problems by breaking them into smaller steps or tasks, choosing and using efficient techniques for calculation. • **Use logical argument to establish the truth of a statement;** give solutions to an appropriate degree of accuracy in the context of the problem.	• Solve increasingly demanding problems and evaluate solutions; explore connections in mathematics across a range of contexts. • **Present a concise, reasoned argument, using symbols, diagrams and graphs and related explanatory text.**
	• Understand the significance of a counter-example. • Understand the relationship between ratio and proportion; solve simple problems about ratio and proportion using informal strategies.	• Suggest extensions to problems, conjecture and generalise; identify exceptional cases or counter-examples. • Consolidate understanding of the relationship between ratio and proportion; reduce a ratio to its simplest form, including a ratio expressed in different units, recognising links with fraction notation; **divide a quantity into two or more parts in a given ratio; use the unitary method to solve simple word problems involving ratio and direct proportion.**	• **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.
Ratio and proportion (78–81)			

Shape, space and measures 4 (9 hours) Geometrical reasoning: lines, angles and shapes (198–201)	• Use 2-D representations to visualise 3-D shapes and deduce some of their properties. • Use ruler and protractor to construct simple nets of 3-D shapes, e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism.	• Know and use geometric properties of cuboids and shapes made from cuboids; begin to use plans and elevations.	• Visualise and use 2-D representations of 3-D objects; analyse 3-D shapes through 2-D projections, including plans and elevations. • Use and interpret maps, scale drawings.
Transformations (216–217) Coordinates (218–219)	• Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information.	• Make simple scale drawings. • Given the coordinates of points A and B, find the mid-point of the line segment AB.	
Construction and loci (220–227)	• Use a ruler and protractor to: - measure and draw lines to the nearest millimetre and angles, including reflex angles, to the nearest degree; - construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA); explore these constructions using ICT.	• **Use straight edge and compasses to construct:** - a triangle, given three sides (SSS); use ICT to explore this construction.	• Use straight edge and compasses to construct a triangle, given right angle, hypotenuse and side (RHS).
		• Find simple loci, both by reasoning and by using ICT, to produce shapes and paths, e.g. an equilateral triangle. • Use bearings to specify direction.	
Mensuration (232–233, 238–241)	• Calculate the surface area of cubes and cuboids.	• **Know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids** and shapes made from cuboids.	• Calculate the surface area and volume of right prisms.

	SUPPORT From the Y7 teaching programme	CORE From the Y8 teaching programme	EXTENSION From the Y9 teaching programme
Handling data 3 (7 hours) Handling data (248–275)	• Given a problem that can be addressed by statistical methods, suggest possible answers.	• Discuss a problem that can be addressed by statistical methods and identify related questions to explore. • Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources.	• Discuss how data relate to a problem; identify possible sources, including primary and secondary sources.
	• Design a data collection sheet or questionnaire to use in a simple survey; construct frequency tables for discrete data, grouped where appropriate in equal class intervals.	• Plan how to collect the data, including sample size; construct frequency tables with given equal class intervals for sets of continuous data.	• **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;** construct tables for large discrete and continuous sets of raw data, choosing suitable class intervals.
		• Collect data using a suitable method, such as observation, controlled experiment, including data logging using ICT, or questionnaire.	
	• Calculate statistics for small sets of discrete data: - find the mode, median and range, and the modal class for grouped data; - calculate the mean, including from a simple frequency table, using a calculator for a larger number of items.	• Calculate statistics, including with a calculator; calculate a mean using an assumed mean; know when it is appropriate to use the modal class for grouped data.	
	• Construct, on paper and using ICT, graphs and diagrams to represent data, including: - frequency diagrams for grouped discrete data; use ICT to generate pie charts.	• **Construct, on paper and using ICT:** **- bar charts and frequency diagrams for continuous data;** **- simple line graphs for time series;** **identify which are most useful in the context of the problem**.	
		• Interpret tables, graphs and diagrams for continuous data and draw inferences that relate to the problem being discussed; relate summarised data to the questions being explored. • Compare two distributions using the range and one or more of the mode, median and mean.	• Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics.
	• Write a short report of a statistical enquiry and illustrate with appropriate diagrams, graphs and charts, using ICT as appropriate; justify choice of what is presented.	• Communicate orally and on paper the results of a statistical enquiry and the methods used, using ICT as appropriate; justify the choice of what is presented.	
Probability (284–285)		• Compare experimental and theoretical probabilities in different contexts.	• Appreciate the difference between mathematical explanation and experimental evidence.
Solving problems (28–29)		• Solve more complex problems by breaking them into smaller steps or tasks, choosing and using graphical representation, and also resources, including ICT.	

Year 9 planning chart

Autumn
36 hours

Number/algebra 1
Proportional reasoning, including:
Calculations
FDPRP
Graphs
6 hours

Algebra 2
Sequences, functions
and graphs
6 hours

SSM 1
Geometrical reasoning:
lines, angles and shapes
Construction
9 hours

HD 1
Handling data
6 hours

Algebra 3
Equations, formulae
and identities
6 hours

Spring
33 hours

Number 2
Calculations and FDPRP
Calculator methods
Solving problems
8 hours

Algebra 4
Integers, powers and roots
Sequences, functions and
graphs, including graphs from
real situations
9 hours

SSM 2
Coordinates
Measures and
mensuration
6 hours

HD 2
Probability
FDPRP
4 hours

SSM 3
Transformations
Geometrical reasoning:
lines, angles and shapes
6 hours

Summer
36 hours

Solving problems and revision
Number, algebra, SSM
6 hours

HD 3
Handling data
6 hours

Algebra 5
Equations and formulae
Graphs
8 hours

SSM 4
Geometrical reasoning:
lines, angles and shapes
Transformations
Mensuration
6 hours

HD 4
Probability
FDPRP
6 hours

Consolidation of KS3 work and start on KS4 work
Number, algebra, SSM, HD
6 hours

35 weeks

105 hours

Using and applying mathematics to solve problems should be integrated into each unit

YEAR 9: AUTUMN TERM

Teaching objectives for the oral and mental activities

- 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, $^3/_4$…
- 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. 432×0.01, $37 \div 0.01$, 0.04×8, $0.03 \div 5$, 13×1.4.
- Recall multiplication and division facts to 10×10. Derive products and quotients of multiples of 10, 100, 1000.
- Use factors to multiply and divide mentally, e.g. 22×0.02, $420 \div 15$.

- Multiply and divide a two-digit number by a one-digit number.
- Use approximations to estimate the answers to calculations, e.g. 39×2.8.

- Solve equations, e.g. $n(n - 1) = 56$, ❣ + ❣ = ⁻46.

- 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.

Teaching objectives for the main activities

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Algebra 1/2 (6 hours) Sequences, functions and graphs (148–163, 172–177)	• Generate and describe integer sequences.	• **Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, on paper and using ICT.** • Generate sequences from practical contexts and **write an expression to describe the *n*th term of an arithmetic sequence.** • Find the inverse of a linear function.	• Find the next term and the *n*th term of quadratic sequences and functions and explore their properties. • Deduce properties of the sequences of triangular and square numbers from spatial patterns. • Plot the graph of the inverse of a linear function; know simple properties of quadratic functions.
	• Express simple functions in symbols; represent mappings expressed algebraically. • **Plot the graphs of linear functions, where *y* is given explicitly in terms of *x*,** on paper and using ICT.	• **Construct functions arising from real-life problems and plot their corresponding graphs.**	
Solving problems (26–27)		• 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.	

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Number 1 (9 hours) Proportional reasoning, including: Fractions, decimals, percentages, ratio and proportion (66–81) Calculations (82–103, 110–111)	• Order decimals. • Add and subtract fractions by writing them with a common denominator; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction. • Interpret percentage as the operator 'so many hundredths of'; express one given number as a percentage of another. • Reduce a ratio to its simplest form, including a ratio expressed in different units; **divide a quantity into two or more parts in a given ratio; use the unitary method to solve simple word problems involving ratio and direct proportion.** • Recall known facts, including fraction to decimal conversions. • Round positive numbers to any given power of 10 and decimals to the nearest whole number, 1 or 2 decimal places.	• Use efficient methods to **add, subtract, multiply and divide fractions,** interpreting division as a multiplicative inverse; cancel common factors before multiplying or dividing. • Recognise when fractions or percentages are needed to compare proportions; solve problems involving percentage changes. • **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. • **Understand the effects of multiplying and dividing by numbers between 0 and 1;** use the laws of arithmetic and inverse operations. • Understand the order of precedence and effect of powers. • 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. • **Make and justify estimates and approximations of calculations.** • Check results using appropriate methods.	 • **Understand and use proportionality and calculate the result of any proportional change using only multiplicative methods;** understand the implications of enlargement for area and volume. • Recognise and use reciprocals. • Estimate calculations by rounding numbers to one significant figure and multiplying or dividing mentally.
Algebra 3 (6 hours) Equations, formulae and identities (112–113, 122–125, 132–137)	• Know the meanings of the words *formula* and *function*. • Construct and solve linear equations with integer coefficients (unknown on either or both sides) using appropriate methods (e.g. inverse operations, transforming both sides in the same way). • Begin to use graphs and set up equations to solve simple problems involving direct proportion.	• Distinguish the different roles played by letter symbols in equations, identities, formulae and functions. • **Construct and solve linear equations with integer coefficients** (with and without brackets, negative signs anywhere in the equation, positive or negative solution) **using an appropriate method.** • Use systematic trial and improvement methods and ICT tools to find approximate solutions of equations such as $x^3 + x = 20$. • Solve problems involving direct proportion using algebraic methods, relating algebraic solutions to graphical representations of the equations; use ICT as appropriate.	 • **Solve a pair of simultaneous linear equations by eliminating one variable; link a graphical representation of an equation or a pair of equations to the algebraic solution;** consider cases that have no solution or an infinite number of solutions.

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Shape, space and measures 1 (9 hours) Geometrical reasoning: lines, angles and shapes (178–189, 194–197)		• Distinguish between conventions, definitions and derived properties.	• Distinguish between practical demonstration and proof; know underlying assumptions, recognising their importance and limitations, and the effect of varying them.
	• **Identify alternate angles and corresponding angles;** **understand a proof that:** **- the sum of the angles of a triangle is 180° and of a quadrilateral is 360°;** - the exterior angle of a triangle is equal to the sum of the two interior opposite angles.	• Explain how to find, calculate and use: - the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons, - the interior and exterior angles of regular polygons.	
	• Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometric properties.	• **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.	• **Understand and apply Pythagoras' theorem.**
		• 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.	• Know that the tangent at any point on a circle is perpendicular to the radius at that point; explain why the perpendicular from the centre to the chord bisects the chord.
Construction and loci (220–227)	• **Use straight edge and compasses to construct:** **- the mid-point 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;** construct a triangle, given three sides (SSS); use ICT to explore these constructions.	• 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 2-D shapes.	• **Know from experience of constructing them that triangles given SSS, SAS, ASA or RHS are unique, but that triangles given SSA or AAA are not.**
		• Find the locus of a point that moves according to a simple rule, both by reasoning and by using ICT.	• Find the locus of a point that moves according to a more complex rule, involving loci and simple constructions.
Solving problems (14–17)		• Explore connections in mathematics across a range of contexts: shape and space.	

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Handling data 1 (6 hours) Handling data (248–275)		• Suggest a problem to explore using statistical methods, frame questions and raise conjectures. • Discuss how data relate to a problem; identify possible sources, including primary and secondary sources.	• **Identify possible sources of bias and plan how to minimise it.**
	• Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources. • Collect data using a suitable method, such as observation, controlled experiment, including data logging using ICT, or questionnaire.	• **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;** construct tables for large discrete and continuous sets of raw data, choosing suitable class intervals; design and use two-way tables.	
	• Calculate statistics, including with a calculator; recognise when it is appropriate to use the range, mean, median and mode.	• Find summary values that represent the raw data, and select the statistics most appropriate to the problem.	• Find the median and quartiles for large data sets; estimate the mean, median and interquartile range of a large set of grouped data.
	• **Construct, on paper and using ICT: - pie charts for categorical data; - bar charts and frequency diagrams for discrete data; identify which are most useful in the context of the problem**.	• Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, including: - line graphs for time series; - scatter graphs to develop further understanding of correlation; identify key features present in the data.	• Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, including: - frequency polygons; - lines of best fit by eye, understanding what they represent.
	• Interpret tables, graphs and diagrams for discrete data and draw inferences that relate to the problem being discussed; relate summarised data to the questions being explored. • Compare two distributions using the range and one or more of the mode, median and mean..	• Interpret graphs and diagrams and draw inferences to support or cast doubt on initial conjectures; have a basic understanding of correlation. • Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics.	• Analyse data to find patterns and exceptions, look for cause and effect and try to explain anomalies.
		• **Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support,** using ICT as appropriate.	• **Examine critically the results of a statistical enquiry, and justify choice of statistical representation in written presentations,** recognising the limitations of any assumptions and their effect on conclusions drawn.

YEAR 9: SPRING TERM

Teaching objectives for the oral and mental activities

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- 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 10×10. Derive products and quotients of multiples of 10, 100, 1000.
- Use known facts to derive unknown facts, e.g. derive 36×24 from 36×25.
- Use knowledge of place value to multiply and divide decimals by multiples of 0.1 and 0.01, e.g. 0.24×0.4, $720 \div 0.03$.

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- Use approximations to estimate the answers to calculations, e.g. 39×2.8.

- Solve equations, e.g. $n(n-1) = 56$, ❣ + ❣ = ⁻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.

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Teaching objectives for the main activities

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Shape, space and measures 2 (6 hours) Coordinates (218–219) Measures and mensuration (228–231, 234–241)	• Given the coordinates of points A and B, find the mid-point of the line segment AB. • Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons).	 • Use units of measurement to calculate, estimate, measure and solve problems in a variety of contexts; convert between area measures (mm^2 to cm^2, cm^2 to m^2, and vice versa) and between volume measures (mm^3 to cm^3, cm^3 to m^3, and vice versa).	• Find points that divide a line in a given ratio, using the properties of similar triangles; given the coordinates of points A and B, calculate the length of AB. • Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction. • **Understand and use measures of speed (and other compound measures such as density or pressure) to solve problems;** solve problems involving constant or average rates of change.
	• **Deduce and use formulae for the area of a triangle, parallelogram** and trapezium; calculate areas of compound shapes made from rectangles and triangles. • **Know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids** and shapes made from cuboids.	• **Know and use the formulae for the circumference and area of a circle.** • Calculate the surface area and volume of right prisms.	• Know and use the formulae for length of arcs and area of sectors of circles. • Calculate lengths, areas and volumes in right prisms, including cylinders.

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Number 2 (8 hours) Place value (36–47)	• Read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01.	• Extend knowledge of integer powers of 10; multiply and divide by any integer power of 10. • Use rounding to make estimates; round numbers to the nearest whole number or to one or two decimal places.	• Write numbers in standard form. • Understand upper and lower bounds; round numbers to three decimal places and a given number of significant figures.
Fractions, decimals, percentages, ratio and proportion (60–65)		• Know that a recurring decimal is an exact fraction.	• Use algebraic methods to convert a recurring decimal to a fraction in simple cases.
Calculations (104–107, 110–111)	• Consolidate standard column procedures for addition and subtraction of integers and decimals with up to two places. • **Use standard column procedures for multiplication and division of integers and decimals, including by decimals such as 0.6 or 0.06; understand where to position the decimal point by considering equivalent calculations.**	• 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.	
Calculator methods (108–109)		• Check results using appropriate methods. • Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation; use the constant, π and sign change keys, function keys for powers, roots and fractions, brackets and the memory. • Enter numbers into a calculator and interpret the display in context (negative numbers, fractions, decimals, percentages, money, metric measures, time).	• Use the reciprocal key of a calculator. • Enter numbers in standard form into a calculator and interpret the display.
Solving problems (28–29)	• Solve more complex problems by breaking them into smaller steps or tasks, choosing and using efficient techniques for calculation.	• **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.	

	SUPPORT From the Y8 teaching programme	**CORE** From the Y9 teaching programme	**EXTENSION** From the Y9 objectives for able pupils
Algebra 4 (9 hours) Integers, powers and roots (52–59)	• Recognise and use multiples, factors (divisors), common factor, highest common factor, lowest common multiple and primes. • Use squares, positive and negative square roots, cubes and cube roots, and index notation for small positive integer powers.	• Use the prime factor decomposition of a number. • Use ICT to estimate square roots and cube roots. • Use index notation for integer powers and simple instances of the index laws.	• **Know and use the index laws** (including in generalised form) **for multiplication and division of positive integer powers;** begin to extend understanding of index notation to negative and fractional powers, recognising that the index laws can be applied to these as well.
Sequences, functions and graphs (164–177) Solving problems (26–27)	• **Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs.**	• **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 situations,** including distance–time graphs. • 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.	• Investigate the gradients of parallel lines and lines perpendicular to these lines. • Plot graphs of simple quadratic and cubic functions, e.g. $y = x^2$, $y = 3x^2 + 4$, $y = x^3$.

Handling data 2 (4 hours) Probability (276–283)	• Know that if the probability of an event occurring is p, then the probability of it not occurring is $1 - p$; **find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way,** using diagrams and tables. • Understand that: - if an experiment is repeated there may be, and usually will be, different outcomes; - increasing the number of times an experiment is repeated generally leads to better estimates of probability.	• Use the vocabulary of probability in interpreting results involving uncertainty and prediction. • Identify all the mutually exclusive outcomes of an experiment; **know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems.** • Estimate probabilities from experimental data.	• Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.
Fractions (66–69)		• Use efficient methods to **add, subtract, multiply and divide fractions,** interpreting division as a multiplicative inverse; cancel common factors before multiplying or dividing.	

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Shape, space and measures 3 (6 hours) Geometrical reasoning: lines, angles and shapes (178–179, 190–191)		• Distinguish between conventions, definitions and derived properties. • Understand congruence.	• Distinguish between practical demonstration and proof; know underlying assumptions, recognising their importance and limitations, and the effect of varying them. • **Apply the conditions SSS, SAS, ASA or RHS to establish the congruence of triangles.** • **Know that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio.**
Transformations (202–217)	• Identify all the symmetries of 2-D shapes. • Understand and use the language and notation associated with enlargement. • Make simple scale drawings.	• Transform 2-D shapes by combinations of translations, rotations and reflections, on paper and using ICT; **know that translations, rotations and reflections preserve length and angle and map objects on to congruent images;** identify reflection symmetry in 3-D shapes. • Enlarge 2-D shapes, given a 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. • Use and interpret maps and scales drawings.	• Enlarge 2-D shapes, given a fractional scale factor; recognise the similarity of the resulting shapes; understand the implications of enlargement for area and volume.
Mensuration (242–247)			• Begin to use sine, cosine and tangent in right-angled triangles to solve problems in two dimensions.
Ratio and proportion (78–81)	• Consolidate understanding of the relationship between ratio and proportion; reduce a ratio to its simplest form, including a ratio expressed in different units.	• **Use proportional reasoning to solve a problem;** interpret and use ratio in a range of contexts.	

YEAR 9: SUMMER TERM

Teaching objectives for the oral and mental activities

• 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 10×10. 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. 0.24×0.4, $720 \div 0.03$. • Use approximations to estimate the answers to calculations, e.g. 0.39×2.8.	• Solve equations, e.g. $n(n-1) = 56$, ❣ + ❣ $=\ ^-46$, $(3 + x)^2 = 25$, $(12 - x)^2 = 49$, ❣ $\times$ ❣ $\times$ ❣ $= 0.008$ • 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.

Teaching objectives for the main activities

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Algebra 5 (6 hours) Equations, formulae and identities (116–121, 138–143)	• **Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.**	• Simplify or transform algebraic expressions by taking out single-term common factors.	• **Square a linear expression, expand the product of two linear expressions of the form $x \pm n$ and simplify the corresponding quadratic expression; establish identities** such as $a^2 - b^2 = (a + b)(a - b)$. • Solve linear inequalities in one variable, and represent the solution set on a number line; begin to solve inequalities in two variables. • Derive and use more complex formulae, and **change the subject of a formula.**
		• Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject.	
Graphs (164–171) Solving problems (6–13)	• **Plot the graphs of linear functions, where y is given explicitly in terms of x,** on paper and using ICT.	• Generate points and plot graphs of linear functions (y given implicitly in terms of x), e.g. $ay + bx = 0$, $y + bx + c = 0$, on paper and using ICT. • Solve increasingly demanding problems; explore connections in mathematics across a range of contexts: algebra.	

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Solving problems and revision (6 hours) Number, algebra, shape, space and measures, handling data Solving problems (2–35)	• **Identify the necessary information to solve a problem.**	• Solve increasingly demanding problems and evaluate solutions; explore connections in mathematics across a range of contexts: number, algebra, shape, space and measures, handling data. • 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.	• **Generate fuller solutions to increasingly demanding problems.**
	• Solve more complex problems by breaking them into smaller steps or tasks, choosing and using efficient techniques for calculation. • **Use logical argument to establish the truth of a statement.**	• **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. • **Present a concise, reasoned argument, using symbols, diagrams, graphs and related explanatory text; give solutions to problems to an appropriate degree of accuracy.**	• **Recognise limitations on the accuracy of data and measurements;** give reasons for choice of presentation, explaining selected features and showing insight into the problem's structure.
		• Suggest extensions to problems, conjecture and generalise; identify exceptional cases or counter-examples, explaining why.	• Justify generalisations, arguments or solutions; pose extra constraints and investigate whether particular cases can be generalised further.
Percentages and proportion (75–81)	• **Use the unitary method to solve simple word problems involving ratio and direct proportion.**	• Solve problems involving percentage changes. • **Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole;** interpret and use ratio in a range of contexts, including solving word problems.	
Sequences, functions and graphs (172–177) Geometrical reasoning: lines, angles and shapes (184–189)	• Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometric properties.	• **Construct functions arising from real-life problems and plot their corresponding graphs.** • **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.	

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Handling data 3 (6 hours) Handling data (250–251, 254–275)	• Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources. • Plan how to collect the data, including sample size; construct frequency tables with given equal class intervals for sets of continuous data. • Calculate statistics, including with a calculator; calculate a mean using an assumed mean; recognise when it is appropriate to use the modal class for grouped data. • **Construct, on paper and using ICT:** **- bar charts and frequency diagrams for continuous data.**	• Discuss how data relate to a problem; identify possible sources, including primary and secondary sources. • Gather data from specified secondary sources, including printed tables and lists from ICT-based sources. • Find summary values that represent the raw data, and select the statistics most appropriate to the problem. • Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry.	• **Identify possible sources of bias and plan how to minimise it.** • Identify what extra information may be required to pursue a further line of enquiry. • Find the median and quartiles for large data sets; estimate the mean, median and interquartile range of a large set of grouped data. • Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, including: - frequency polygons; - lines of best fit by eye, understanding what they represent; identify key features present in the data.
	• Interpret tables, graphs and diagrams for continuous data, and draw inferences that relate to the problem being discussed; relate summarised data to the questions being explored. • Construct and use stem-and-leaf diagrams.	• Interpret graphs and diagrams and draw inferences to support or cast doubt on initial conjectures; have a basic understanding of correlation. • Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics. • **Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support,** using ICT as appropriate.	• Analyse data to find patterns and exceptions, look for cause and effect and try to explain anomalies. • **Examine critically the results of a statistical enquiry, and justify choice of statistical representation in written presentations**, recognising the limitations of any assumptions and their effect on conclusions drawn.
Solving problems (28–29)		• **Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT.**	

	SUPPORT From the Y8 teaching programme	CORE From the Y9 teaching programme	EXTENSION From the Y9 objectives for able pupils
Shape, space and measures 4 (6 hours) Geometrical reasoning: lines, angles and shapes (184–189, 198–201)	• Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometric properties. • Know and use geometric properties of cuboids and shapes made from cuboids.	• **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. • Visualise and use 2-D representations of 3-D objects; analyse 3-D shapes through 2-D projections, including plans and elevations.	• **Understand and apply Pythagoras' theorem.**
Transformations (216–217) Mensuration (238–241)	• Make simple scale drawings. • **Know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids** and shapes made from cuboids.	• Use and interpret maps and scale drawings. • Calculate the surface area and volume of right prisms.	• Calculate lengths, areas and volumes in right prisms, including cylinders. • Begin to use sine, cosine and tangent in right-angled triangles to solve problems in two dimensions.
Solving problems (30–31)		• **Present a concise, reasoned argument, using symbols, diagrams and related explanatory text; give solutions to problems to an appropriate degree of accuracy.**	• **Recognise limitations on the accuracy of measurements.**

Handling data 4 (6 hours)
Probability
(276–285)
	• Know that if the probability of an event occurring is *p*, then the probability of it not occurring is 1 – *p*; **find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way,** using diagrams and tables.
	• Understand that:
	  - if an experiment is repeated there may be, and usually will be, different outcomes;
	  - increasing the number of times an experiment is repeated generally leads to better estimates of probability.
		• Use the vocabulary of probability in interpreting results involving uncertainty and prediction.
		• Identify all the mutually exclusive outcomes of an experiment; **know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems.**
		
		• Estimate probabilities from experimental data.
		
		• Compare experimental and theoretical probabilities in a range of contexts; appreciate the difference between mathematical explanation and experimental evidence.
			• Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.

Consolidation of KS3 work and start on KS4 work (6 hours) Number Algebra Shape, space and measures Handling data			

Planning in secondary special schools

Planning for mathematics presents a particular challenge to teachers in secondary special schools as pupils' different rates of progress are likely to have resulted in a wide range of attainment. Some special schools and units will adapt the mainstream plans. The following pages show examples of medium-term plans trialled by special schools where the range of attainment is wide, with some pupils having complex learning difficulties and almost all are working below age-related expectations of the National Curriculum in mathematics. The principle used was to start from the main yearly teaching programme and to 'track back' to appropriate objectives, thus maintaining the principle of the class working on similar topics.

The *Framework for teaching mathematics: Years 7, 8 and 9* offers example planning charts for each year. These show one way of covering the curriculum for all pupils. Topics such as 'sequences and functions', 'transformations' and 'probability' may appear to be inaccessible to many pupils with special needs. The following medium-term plans indicate how planning might be adapted to allow pupils in special schools to access the mathematics curriculum to which they are entitled.

Example

Planning for a Year 7 class needs to address the needs of pupils working at:

> Levels P1 to P3;
>
> Levels P4 to P8;
>
> National Curriculum levels 1 and 2;
>
> National Curriculum levels 3, 4 and above.

One possible approach might be to use the optional Year 7 planning chart and the Year 7 sample medium-term plan as a basis for planning. The following sample units show how a teacher might track back along the strands through Year 6, Year 5… to Year 1 objectives and then refer to the P scales.

The timing and balance of topics may need to be altered to meet pupils' particular needs.

All pupils in the class could be working on the same topic, providing opportunities for whole-class activity at the beginning and end of lessons and for class, group or individual work in the main part of the lesson.

Key Stage 3 *National Strategy*

Year 7: Autumn term

Page numbers refer to the *Framework for teaching mathematics: Years 7, 8 and 9* supplement of examples for the core teaching programme

YEAR 7: AUTUMN TERM

Teaching objectives for the main activities

	SUPPORT From levels P1 to P3	SUPPORT From levels P4 to P8	SUPPORT From Y1, Y2 and Y3	SUPPORT From Y4, Y5 and Y6	CORE From the Y7 teaching programme
Number 1 (6 hours) Place value (36–41)	• Remember learned responses for longer. (P2) • Anticipate known events. (P3) • Accept and engage in exploration with help from others. (P2) • Focus attention on certain objects. (P1)	• Use practical methods to associate names and symbols with numbers. (P6) • Join in rote-counting up to 5/10 and use the numbers in familiar activities and games. (P6/P7)	• Say number names to at least 100, from and back to zero. • Know what each digit in a two-digit number represents including 0 as a place holder. • Use decimal notation in the context of money.	• Read and write whole numbers in figures and words. • **Use decimal notation for tenths and hundredths;** know what each digit represents in numbers with up to two decimal places. • Order a set of decimals or measurements with the same number of decimal places. • Calculate a temperature rise or fall across 0 °C.	• Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect.
Integers (48–51)					• Compare and order decimals in different contexts; know that when comparing measurements they must be in the same units. • Understand negative numbers as positions on a number line; order, add and subtract positive and negative integers in context.
Mental calculations (88–91)		• In practical situations, add one to or take one away from a number of objects. (P8) • Begin to recognise differences in quantity. (P7)	• Recall addition and subtraction facts of numbers to 10.	• Recall addition and subtraction facts of numbers to 20. • Know squares up to 10×10.	• Consolidate the rapid recall of number facts, including positive integer complements to 100 and multiplication facts to 10×10, and quickly derive associated division facts.
Written calculations (102–105)				• Approximate first and use informal pencil and paper methods to support addition and subtraction.	• Make and justify estimates and approximations of calculations. • Use standard column procedures to add and subtract whole numbers and decimals with up to two places. • Enter numbers and interpret the display in different contexts.
Calculator methods (108–109)				• Develop calculator skills and use a calculator effectively.	
Solving problems (2–11)	• Apply potential solutions systematically to solve problems. (P3)	• Solve simple problems.	• Solve simple word problems.	• Solve word problems.	• **Solve word problems and investigate in a range of contexts:** number; compare and evaluate solutions.

Page numbers refer to the *Framework for teaching mathematics: Years 7, 8 and 9* supplement of examples for the core teaching programme

	SUPPORT From levels P1 to P3	SUPPORT From levels P4 to P8	SUPPORT From Y1, Y2 and Y3	SUPPORT From Y4, Y5 and Y6	CORE From the Y7 teaching programme
Algebra 1 (6 hours) Sequences (144–163)	• Begin to show anticipation in response to familiar people, routines, activities and actions. (P3) • Remember learned responses over short periods of time. (P2) • Show emerging awareness of activities and experiences. (P1)	• Show awareness of time through some familiarity with significant times of the day such as meal times. (P8) • Count items up to 5/10.	• Count and order numbers to 20/50/100. • Count in fives. • Count to 5/10/20 forwards and backwards in ones. • Know the days of the week. • Order the months of the year.	• Recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back. • Know squares to at least 10×10.	• Generate and describe simpler integer sequences. • Generate terms of a simple sequence, given a rule (e.g. finding a term from the previous term, finding a term given its position in the sequence). • Generate sequences from practical contexts and describe the general term in simple cases. • Express simple functions in words, then using symbols; represent them in mappings. • **Use letter symbols to represent unknown numbers or variables.**
Formulae and identities (112–113) Solving problems (32–35)	• Apply potential solutions systematically to solve problems. (P3)	• Demonstrate an interest in the relationship between objects. (P4)	• Recognise all coins. • Solve money and 'real-life' problems.	• Solve simple word problems.	• Suggest extensions to problems by asking 'What if…?'; begin to generalise and to understand the significance of a counter-example.

Page numbers refer to the *Framework for teaching mathematics: Years 7, 8 and 9* supplement of examples for the core teaching programme

	SUPPORT From levels P1 to P3	**SUPPORT** From levels P4 to P8	**SUPPORT** From Y1, Y2 and Y3	**SUPPORT** From Y4, Y5 and Y6	**CORE** From the Y7 teaching programme
Shape, space and measures 1 (4 hours)	• Explore materials in increasingly complex ways. (P3) • Co-operate in shared exploration and supported participation. (P2) • Show simple reflex responses. (P1)	• Start to pick out named shapes from a collection. (P7) • Manipulate 3-dimensional shapes. (P6)	• Classify and describe 3-D and 2-D shapes.	• Identify different nets for an open cube. • Know the names and language of 2-D and 3-D shapes.	• Use 2-D representations to visualise 3-D shapes and deduce some of their properties.
Mensuration (198–201, 228–231, 234–241)				• Measure and draw lines to the nearest millimetre. • Record estimates and readings from scales to a suitable degree of accuracy.	• Use names and abbreviations of units of measurement to measure, estimate, calculate and solve problems in everyday contexts involving length, area.
			• Calculate the perimeter of a shape made from rectangles. • Calculate the area of a rectangle by counting squares.	• **Understand that area is measured in square centimetres (cm^2).** • Understand, measure and calculate perimeters of rectangles and regular polygons.	• Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles.
Solving problems (18–21)					• Calculate the surface area of cubes and cuboids. • **Solve word problems and investigate in a range of contexts:** length, perimeter and area.

Page numbers refer to the *Framework for teaching mathematics: Years 7, 8 and 9* supplement of examples for the core teaching programme

	SUPPORT From levels P1 to P3	SUPPORT From levels P4 to P8	SUPPORT From Y1, Y2 and Y3	SUPPORT From Y4, Y5 and Y6	CORE From the Y7 teaching programme

Handling data 1
(6 hours)
Handling data
(256–61, 268–271)
					• Calculate statistics for small sets of discrete data:
					  - find the mode, median and range, and the modal class for grouped data;
					  - calculate the mean, including from a simple frequency table, using a calculator for a larger number of items.

	• Respond to options and choices with actions or gestures. (P3)
	• May give intermittent reactions to activities and experiences. (P1)
	• Apply potential solutions systematically to problems. (P3)
		• Complete a range of classification activities using given criteria. (P7)
		• Begin to identify when an object is different and does not belong to given categories. (P6)
		• Begin to sort sets of objects according to a single attribute. (P5)
			• Solve a problem by sorting, classifying and organising information in a table, pictogram, block graph or bar chart.	• **Solve a problem by** representing, **extracting and interpreting data in tables, graphs, charts** and diagrams, for example:
				  - line graphs;
				  - frequency tables and bar charts.
					• Interpret diagrams and graphs (including pie charts), and draw conclusions based on the shape of graphs and simple statistics for a single distribution.

Probability (276–283)	• Perform actions often by trial and improvement. (P2)			• Discuss the chance or likelihood of particular events.	• Use vocabulary and ideas of probability, drawing on experience. • **Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts;** identify all the possible mutually exclusive outcomes of a single event. • Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data.