

Mathematics Department

Year 7

Scheme of Work

Key Objectives

- Simplify fractions by cancelling all common factors; identify equivalent fractions.
- Recognise the equivalence of percentages, fractions and decimals.
- Extend mental methods of calculation to include decimals, fractions and percentages.
- 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.
- Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations and methods.
- Check a result by considering whether it is of the right order of magnitude.
- Use letter symbols to represent unknown numbers or variables.
- Know and use the order of operations and understand that algebraic operations follow the same conventions and order as arithmetic operations.
- Plot the graphs of simple linear functions.
- Identify parallel and perpendicular lines; know the sum of angles at a point, on a straight line and in a triangle.
- Convert one metric unit to another (e.g. grams to kilograms); read and interpret scales on a range of measuring instruments.
- Compare two simple distributions using the range and one of the mode, median or mean.
- Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts.
- Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions.

Number Overview

Unit	Objective
N1	Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect.
N1	Compare and order decimals in different contexts; know that when comparing measurements they must be in the same units.
N1	Understand negative numbers as positions on a number line; order, add and subtract positive and negative integers in context.
N1 N5	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.
N1 N3 N5	Make and justify estimates and approximations of calculations.
N1 N5	Use standard column procedures to add and subtract whole numbers and decimals with up to two places.
N1	Enter numbers and interpret the display in different contexts (decimals, money).
N1	Solve word problems and investigate in a range of contexts: number; compare and evaluate solutions.
N2	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.
N2 N5	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.
N2 N4 N5	Understand percentage as the 'number of parts per 100'; recognise the equivalence of percentages, fractions and decimals; calculate simple percentages and use percentages to compare simple proportions.
N2 N3 N5	Consolidate and extend mental methods of calculation to include decimals, fractions and percentages , accompanied where appropriate by suitable jottings; solve simple word problems mentally.
N2 N3 N4 N5	Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.
N2 N3 N5	Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources, including ICT.
N2 N3	Present and interpret solutions in the context of the original problem; explain and justify methods and conclusions , orally and in writing.
N3	Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.
N3	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.
N3	Know and use the order of operations , including brackets.
N3 N5	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.
N3 N5	Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys.
N3	Use names and abbreviations of units of measurement to measure, estimate, calculate and solve problems in everyday contexts involving length, area, mass, capacity, time and angle; convert one metric unit to another (e.g. grams to kilograms); read and interpret scales on a range of measuring instruments.
N4	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.
N5 (A3)	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.
N5	Interpret the display of a calculator in different contexts (decimals, percentages).

Algebra Overview

Unit	Objective
A1	Generate and describe simple integer sequences.
A1 A3	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).
A1 A3 A5	Generate sequences from practical contexts and describe the general term in simple cases.
A1 A3 A5	Express simple functions in words, then using symbols; represent them in mappings.
A1 A2 A4	Use letter symbols to represent unknown numbers or variables; know the meanings of the words <i>term</i> , <i>expression</i> and <i>equation</i> .
A1 A5 (SSM4)	Suggest extensions to problems by asking ‘What if...?’; begin to generalise and to understand the significance of a counter-example.
A2 A4	Understand that algebraic operations follow the same conventions and order as arithmetic operations.
A2 A4	Simplify linear algebraic expressions by collecting like terms; begin to multiply a single term over a bracket (integer coefficients).
A2 A5	Use simple formulae from mathematics and other subjects; substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.
A2 A3	Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams, tables and graphs.
A3 (N5)	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.
A3	Recognise the first few triangular numbers, squares of numbers to at least 12×12 and the corresponding roots.
A3 (N3 N5)	Use the square root key.
A3 A5	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.
A3	Solve word problems and investigate in a range of contexts: number and algebra
A4 A5	Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations).
A5	Begin to plot and interpret the graphs of simple linear functions arising from real-life situations.

Shape, Space and Measures Overview

Unit	Objective
SSM1 SSM3	Use 2-D representations to visualise 3-D shapes and deduce some of their properties.
SSM1	Use names and abbreviations of units of measurement to measure, estimate, calculate and solve problems in everyday contexts involving length, area,
SSM1	Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles.
SSM1	Calculate the surface area of cubes and cuboids.
SSM1	Solve word problems and investigate in a range of contexts: length, perimeter and area
SSM2	Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes.
SSM2	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.
SSM2 SSM3	Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals
SSM2	Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information.
SSM2	Use angle measure; distinguish between and estimate the size of acute, obtuse and reflex angles.
SSM3 SSM5	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.
SSM3 SSM5	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.
SSM4	Understand and use the language and notation associated with reflections, translations and rotations.
SSM4	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
SSM4 SSM5	Explore transformations and symmetries using ICT.
SSM4	Solve word problems and investigate in a range of contexts: shape and space.
SSM4 (A1 A5)	Suggest extensions to problems by asking ‘What if...?’; begin to generalise and to understand the significance of a counter-example.
SSM5	Use ruler and protractor to construct simple nets of 3-D shapes, e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism.

Handling Data Overview

Unit	Objective
HD1 HD3	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.
HD1 HD2 HD3	Interpret diagrams and graphs (including pie charts), and draw simple conclusions based on the shape of graphs and simple statistics for a single distribution.
HD1	Use vocabulary and ideas of probability, drawing on experience.
HD1 HD3	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.
HD1 HD3	Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data.
HD2	Given a problem that can be addressed by statistical methods, suggest possible answers.
HD2 HD3	Decide which data would be relevant to an enquiry and possible sources.
HD2 HD3	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.
HD2	Collect small sets of data from surveys and experiments, as planned.
HD2 HD3	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.
HD2	Solve word problems and investigate in a range of contexts: handling data.
HD3	Compare two simple distributions using the range and one of the mode, median or mean.
HD3	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.
HD3	Compare experimental and theoretical probabilities in simple contexts.

Mental and Oral Activities

Autumn Term

- Read and write whole numbers in figures and words.
- Multiply and divide whole numbers by 10, 100, and 1000.
- Count on and back in steps of 0.1, 0.2, 0.25, $\frac{1}{2}$, $\frac{1}{4}$...
- 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.

Spring Term

- 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, $\frac{3}{4}$...
- 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, $\frac{3}{4}$.
- 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.

Summer Term

- 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
- 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 & mm, km & m, kg & g, litres & ml.
- Convert between metric and common imperial units.
- Discuss and interpret graphs.
- Apply mental skills to solve simple problems.

UNIT 2	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Number 1 (6 hours) Place value</p> <p>Integers</p> <p>Calculations</p> <p>Calculator methods</p> <p>Solving problems</p>	<ul style="list-style-type: none"> • 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. • Calculate a temperature rise and fall across 0 °C. • Know squares to at least 10×10. • Use informal pencil and paper methods to support, record or explain additions and subtractions. • Develop calculator skills and use a calculator effectively. 	<ul style="list-style-type: none"> • Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect. (MF: 1, 2, 3) • Compare and order decimals in different contexts; know that when comparing measurements they must be in the same units. (MF: 1, 2, 3) • Understand negative numbers as positions on a number line; order, add and subtract positive and negative integers in context. (MF: 1, 2, 3) • 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. • Make and justify estimates and approximations of calculations. (MF: 1, 2, 3) • Use standard column procedures to add and subtract whole numbers and decimals with up to two places. (MF: 1, 2, 3) • 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. (MF: 1, 2, 3) 	<ul style="list-style-type: none"> • Add, subtract, multiply and divide integers. • 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.

UNIT 4	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Number 2 (5 hours) Fractions, decimals, percentages</p> <p>Calculations</p> <p>Solving problems</p>	<ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> Find a difference by counting up through the next multiple of 10, 100 or 1000. Add and subtract mentally pairs of two-digit numbers. 	<ul style="list-style-type: none"> 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. $0.23 = \frac{23}{100}$; use a diagram to compare two or more simple fractions. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> Begin to add and subtract simple fractions and those with common denominators (Goes to Number 5); calculate simple fractions of quantities and measurements (whole-number answers); multiply a fraction by an integer. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> Understand percentage as the 'number of parts per 100'; recognise the equivalence of percentages, fractions and decimals; calculate simple percentages. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> 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. <p>(MF: 2, 3)</p> <ul style="list-style-type: none"> 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. <p>(MF: 2, 3)</p>	<ul style="list-style-type: none"> Know that a recurring decimal is a fraction; use division to convert a fraction to a decimal; order fractions by converting them to decimals. <ul style="list-style-type: none"> Calculate fractions of quantities and measurements (fraction answers); multiply and divide an integer by a fraction. <p>(MF: 3)</p> <ul style="list-style-type: none"> Find the outcome of a given percentage increase or decrease. <p>(MF: 3)</p> <ul style="list-style-type: none"> Recall fraction to decimal conversions.

UNIT 5	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Handling data 1 (5 hours) Handling data</p> <p>Probability</p>	<ul style="list-style-type: none"> • Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams, for example: <ul style="list-style-type: none"> - line graphs; - frequency tables and bar charts. <p>(MF: 1)</p>	<ul style="list-style-type: none"> • Calculate statistics for small sets of discrete data: <ul style="list-style-type: none"> - 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. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • Interpret diagrams and graphs (including pie charts), and draw conclusions based on the shape of graphs and simple statistics for a single distribution. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • Use vocabulary and ideas of probability, drawing on experience. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • 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. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data. <p>(MF: 1, 2, 3)</p>	<ul style="list-style-type: none"> • Recognise when it is appropriate to use the range, mean, median and mode; calculate a mean using an assumed mean. <p>(MF: 3)</p> <ul style="list-style-type: none"> • 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. <p>(MF: 3)</p>

UNIT 6	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Algebra 2 (5 hours) Equations, formulae and identities</p> <p>Constructing and solving equations</p> <p>Solving problems</p>	<ul style="list-style-type: none"> Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. Use brackets. 	<ul style="list-style-type: none"> Use letter symbols to represent unknown numbers or variables; know the meanings of the words <i>term</i>, <i>expression</i> and <i>equation</i>. (MF: 1, 2, 3) Understand that algebraic operations follow the same conventions and order as arithmetic operations. (MF: 1, 2) Simplify linear algebraic expressions by collecting like terms; begin to multiply a single term over a bracket (integer coefficients). (MF: 1, 2) Use simple formulae from mathematics and other subjects, substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula. (MF: 1, 2, 3) Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams and tables. (MF: 1, 2, 3) 	<ul style="list-style-type: none"> Begin to distinguish the different roles played by letter symbols in equations, formulae and functions; know the meanings of the words <i>formula</i> and <i>function</i>. 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. 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 $2x^3$).

UNIT 9	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
Number and measures 3 (7 hours) Place value		<ul style="list-style-type: none"> Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place. (MF: 1, 2, 3)	<ul style="list-style-type: none"> Round positive numbers to any given power of 10; round decimals to the nearest whole number or to one or two decimal places.
Calculations	<ul style="list-style-type: none"> Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. 	<ul style="list-style-type: none"> 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. (MF: 1, 2, 3)	
		<ul style="list-style-type: none"> Know and use the order of operations, including brackets. (MF: 1, 2, 3)	
	<ul style="list-style-type: none"> Know multiplication facts up to 10×10. 		<ul style="list-style-type: none"> Recall products such as 0.7 and 6, and 0.03 and 8.
	<ul style="list-style-type: none"> Add several numbers. Use doubling and halving. Partition to multiply mentally $TU \times U$. 	<ul style="list-style-type: none"> Consolidate and extend mental methods of calculation to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings; solve simple word problems mentally. 	
		<ul style="list-style-type: none"> Make and justify estimates and approximations of calculations. 	
	<ul style="list-style-type: none"> Extend written methods to: <ul style="list-style-type: none"> $HTU \times U$ and $U.t \times U$; $TU \times TU$; $HTU \div U$. (MF: 1) Divide £.p by a two-digit number to give £.p. Round up or down after division, depending on the context. 	<ul style="list-style-type: none"> 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. (MF: 2, 3)	<ul style="list-style-type: none"> 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.
		<ul style="list-style-type: none"> Check a result by considering whether it is of the right order of magnitude and by working the problem backwards. (MF: 1, 2, 3)	

Calculator methods	<ul style="list-style-type: none"> Develop calculator skills and use a calculator effectively. 	<ul style="list-style-type: none"> Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys. (MF: 2, 3) 	
Measures (228–231)	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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. (MF: 1, 2, 3) 	<ul style="list-style-type: none"> Know rough metric equivalents of imperial measures in daily use.
Solving problems (28–31)	<ul style="list-style-type: none"> Use all four operations to solve word problems, including time. 	<ul style="list-style-type: none"> Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources, including ICT. (MF: 1, 2, 3) 	
		<ul style="list-style-type: none"> Present and interpret solutions in the context of the original problem; explain and justify methods and conclusions, orally and in writing. (MF: 1, 2, 3) 	<ul style="list-style-type: none"> Give solutions to an appropriate degree of accuracy in the context of the problem.

UNIT 10	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Algebra 3 (5 hours) Integers, powers and roots</p> <p>Calculator methods</p> <p>Sequences, functions and graphs</p> <p>Solving problems</p>	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Recognise and use multiples, factors (divisors), common factor and primes (less than 100); use simple tests of divisibility. (MF: 1, 2, 3) Recognise the first few triangular numbers, squares of numbers to at least 12×12, and the corresponding roots. (MF: 1, 2, 3) 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. (MF: 1, 2, 3) Solve word problems and investigate in a range of contexts: number and algebra. (MF: 2, 3) Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams, tables and graphs. (MF: 2, 3) 	<ul style="list-style-type: none"> Find the prime factor decomposition of a number. Use squares, and positive and negative square roots. (MF: 3) 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. (MF: 3) Solve more complex problems by breaking them into smaller steps. Represent problems and interpret solutions in algebraic or graphical form, using correct notation.

UNIT 11	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
Shape, space and measures 3 (3 hours) Geometrical reasoning: lines, angles and shapes	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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. (MF: 1, 2, 3)	<ul style="list-style-type: none"> Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals.
		<ul style="list-style-type: none"> Use 2-D representations to visualise 3-D shapes and deduce some of their properties. 	<ul style="list-style-type: none"> Classify quadrilaterals by their geometric properties. (MF: 3)
Construction	<ul style="list-style-type: none"> Use a protractor to measure and draw acute and obtuse angles to the nearest degree. 	<ul style="list-style-type: none"> Use a ruler and protractor to: <ul style="list-style-type: none"> 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. (MF: 1, 2, 3)	<ul style="list-style-type: none"> Use straight edge and compasses to construct: <ul style="list-style-type: none"> the mid-point and perpendicular bisector of a line segment; the bisector of an angle; construct a triangle given three sides (SSS). (MF: 3)

UNIT 12	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Number 4 (4 hours) Fractions, decimals, percentages</p> <p>Calculations</p>	<ul style="list-style-type: none"> • 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.....) <p>(MF: 1)</p>	<ul style="list-style-type: none"> • 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. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • Check a result by considering whether it is of the right order of magnitude and by working the problem backwards. 	<ul style="list-style-type: none"> • 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.

UNIT 13	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Algebra 4 (4 hours) Equations, formulae and identities</p>	<ul style="list-style-type: none"> Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. Use brackets. 	<ul style="list-style-type: none"> Use letter symbols to represent unknown numbers or variables; know the meanings of the words <i>term</i>, <i>expression</i> and <i>equation</i>. (MF: 1, 2, 3) 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). (MF: 1, 2, 3) Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations). (MF: 1, 2, 3) 	<ul style="list-style-type: none"> Begin to distinguish between the different roles played by letter symbols in equations, formulae and functions; know the meanings of the words <i>formula</i> and <i>function</i>. 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).

UNIT 15	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Handling data 3 (3 hours) Handling data</p>	<ul style="list-style-type: none"> Find the mode and range of a set of data. Begin to find the median and the mean of a set of data. <ul style="list-style-type: none"> Solve a problem by representing, extracting and interpreting data in tables, graphs and charts. 	<ul style="list-style-type: none"> Decide which data would be relevant to an enquiry and possible sources. (MF: 1, 2, 3) 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. (MF: 1, 2, 3) Calculate statistics for small sets of discrete data: <ul style="list-style-type: none"> 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. (MF: 1) Construct, on paper and using ICT, graphs and diagrams to represent data, including: <ul style="list-style-type: none"> bar-line graphs; frequency diagrams for grouped discrete data; use ICT to generate pie charts. (MF: 1, 2, 3) Interpret diagrams and graphs (including pie charts), and draw conclusions based on the shape of graphs and simple statistics for a single distribution. (MF: 2, 3) Compare two simple distributions using the range and one of the mode, median or mean. (MF: 2, 3) 	<ul style="list-style-type: none"> 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. (MF: 3) Construct on paper and using ICT: <ul style="list-style-type: none"> pie charts for categorical data; simple line graphs for time series. Interpret tables, graphs and diagrams for both discrete and continuous data.

		<ul style="list-style-type: none"> 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. (MF: 1, 2, 3) 	
Probability		<ul style="list-style-type: none"> 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. (MF: 1, 2, 3) Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data. (MF: 1, 2, 3) Compare experimental and theoretical probabilities in simple contexts. (MF: 2, 3) 	<ul style="list-style-type: none"> 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. Understand that: <ul style="list-style-type: none"> - 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. (MF: 3)

UNIT 16	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Number 5 (6 hours) Place value</p> <p>Calculations</p>	<ul style="list-style-type: none"> Recognise multiples up to 10×10; know simple tests of divisibility. Identify factors of two-digit numbers. (MF: 1) <ul style="list-style-type: none"> Consolidate mental methods: <ul style="list-style-type: none"> - find a difference by counting up; - add or subtract a multiple of 10 then adjust. Add and subtract mentally pairs of two-digit numbers. <ul style="list-style-type: none"> Approximate first and use informal pencil and paper methods to EXTENSION addition and subtraction. Extend written methods to: <ul style="list-style-type: none"> - $\text{ThHTU} \times \text{U}$ and $\text{U.t} \times \text{U}$; - $\text{TU} \times \text{TU}$; - $\text{HTU} \div \text{U}$. Divide £.p by a two-digit number to give £.p. Round up or down after division, depending on context. 	<ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> Consolidate and extend mental methods to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings; solve simple word problems mentally. <ul style="list-style-type: none"> 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. (MF: 1, 2) 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. (MF: 1, 2, 3) <ul style="list-style-type: none"> Check a result by considering whether it is of the right order of magnitude and by working the problem backwards. 	<ul style="list-style-type: none"> Find the prime factor decomposition of a number. <ul style="list-style-type: none"> 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. Extend mental calculations to squares and square roots, cubes and cube roots. <ul style="list-style-type: none"> 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. (MF: 3)

Calculator methods		<ul style="list-style-type: none"> Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys. <p>(MF: 2, 3)</p>	
		<ul style="list-style-type: none"> Interpret the display of a calculator in different contexts (decimals, percentages). 	
Fractions and percentages		<ul style="list-style-type: none"> Calculate simple fractions of quantities and measurements (whole-number answers); multiply a fraction by an integer. Begin to add and subtract simple fractions and those with common denominators (From N2) <p>(MF: 2, 3)</p> <ul style="list-style-type: none"> Recognise the equivalence of percentages, fractions and decimals; calculate simple percentages and use percentages to compare simple proportions. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources, including ICT. <p>(MF: 1, 2, 3)</p>	<ul style="list-style-type: none"> Calculate fractions of quantities and measurements (fraction answers); multiply and divide an integer by a fraction.
Solving problems			

UNIT 17	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Algebra 5 (5 hours) Equations, formulae and identities</p> <p>Sequences, functions and graphs</p> <p>Solving problems</p>	<ul style="list-style-type: none"> Understand and use the relationships between the four operations, and the principles (not the names) of the arithmetic laws. Use brackets. Read and plot coordinates in all four quadrants. 	<ul style="list-style-type: none"> Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations). (MF: 1, 2, 3) Use simple formulae from mathematics and other subjects, substitute positive integers in simple linear expressions and formulae and, in simple cases, derive a formula. (MF: 1, 2, 3) Generate sequences from practical contexts and describe the general term in simple cases. (MF: 1, 2, 3) 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. (MF: 2, 3) Begin to plot and interpret the graphs of simple linear functions arising from real-life situations. (MF: 1, 2, 3) Suggest extensions to problems by asking 'What if...?'; begin to generalise and to understand the significance of a counter-example. (MF: 1, 2, 3) 	<ul style="list-style-type: none"> 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). 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 $2x^3$). Begin to use linear expressions to describe the nth term of an arithmetic sequence. 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.

UNIT 18	SUPPORT: Y6 + Level 3	CORE: Level 4-6 Teaching Objectives	EXTENSION: Y8 + Level 7
<p>Shape, space and measures 5 (4 hours) Geometrical reasoning: lines, angles and shapes</p> <p>Construction</p>	<ul style="list-style-type: none"> • 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. <p>Use a protractor to measure and draw acute and obtuse angles to the nearest degree.</p> <ul style="list-style-type: none"> • Visualise 3-D shapes from 2-D drawings and identify different nets for a closed cube. 	<ul style="list-style-type: none"> • 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. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • Explore transformations and symmetries using ICT. <p>(MF: 1, 2, 3)</p> <ul style="list-style-type: none"> • Use a ruler and protractor to: <ul style="list-style-type: none"> - construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA); Explore these constructions using ICT. <ul style="list-style-type: none"> • Use a ruler and protractor to construct simple nets of 3-D shapes, e.g. cuboid, regular tetrahedron, square-based pyramid, and triangular prism. <p>(MF: 1, 2, 3)</p>	<ul style="list-style-type: none"> • Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals. • Classify quadrilaterals by their geometric properties. <p>Use straight edge and compasses to construct:</p> <ul style="list-style-type: none"> - the mid-point and perpendicular bisector of a line segment; - the bisector of an angle; <p>Construct a triangle given three sides (SSS).</p>