Content of *Mathematics Explained for Primary Teachers, 4th edition.*	Scottish Curriculum for Excellence: Numeracy and Mathematics. Experiences and Outcomes (2010). Early, first, second and third levels.	Scottish Curriculum for Excellence: Mathematics. Principles and Practice (2010)
Chapter 2: Mathematics in the primary curriculum • the different kinds of reason for teaching mathematics in the primary school; • the contribution of mathematics to everyday life and society; • the contribution of mathematics to other areas of the curriculum; • the contribution of mathematics to the learner's intellectual development; • the importance of mathematics in promoting enjoyment of learning; • how mathematics is important as a distinctive form of knowledge; • how the essential content of the primary curriculum in England is not just about knowledge and skills but also about using and applying mathematics; • the various components of using and applying mathematics in the primary curriculum in England; • the relationship of numeracy to mathematical understanding.	**My learning in mathematics enables me to:** • develop a secure understanding of the concepts, principles and processes of mathematics and apply these in different contexts, including the world of work; • engage with more abstract mathematical concepts and develop important new kinds of thinking; • understand the application of mathematics, its impact on our society past and present, and its potential for the future; • develop essential numeracy skills which will allow me to participate fully in society; • establish firm foundations for further specialist learning; • understand that successful independent living requires financial awareness, effective money management, using schedules and other related skills. **Experiences and outcomes** • I have discussed the important part that numbers play in the world and explored a variety of systems that have been used by civilisations throughout history to record numbers (first level). • I have worked with others to explore, and present our findings on, how mathematics impacts on the world and the important part it has played in advances and inventions (second level). • I have worked with others to research a famous mathematician and the work they are known for, or investigated a mathematical topic and have prepared and delivered a short presentation (third level).	**What can learning in mathematics enable children and young people to achieve?** • Mathematics is important in our everyday life, allowing us to make sense of the world around us and to manage our lives. Using mathematics enables us to model real-life situations and make connections and informed predictions. It equips us with the skills we need to interpret and analyse information, simplify and solve problems, assess risk and make informed decisions. • Mathematics plays an important role in areas such as science or technologies, and is vital to research and development in fields such as engineering, computing science, medicine and finance. Learning mathematics gives children and young people access to the wider curriculum and the opportunity to pursue further studies and interests. • Because mathematics is rich and stimulating, it engages and fascinates learners of all ages, interests and abilities. Learning mathematics develops logical reasoning, analysis, problem-solving skills, creativity and the ability to think in abstract ways. It uses a universal language of numbers and symbols which allows us to communicate ideas in a concise, unambiguous and rigorous way.

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		• Mathematics equips us with many of the skills required for life, learning and work. Understanding the part that mathematics plays in almost all aspects of life is crucial. This reinforces the need for mathematics to play an integral part in lifelong learning and be appreciated for the richness it brings.
		How can I make connections beyond mathematics?
		• There are many opportunities to develop mathematical concepts in all other areas of the curriculum. Patterns and symmetry are fundamental to art and music; time, money and measure regularly occur in modern languages, home economics, design technology and various aspects of health and wellbeing; graphs and charts are regularly used in science and social studies; scale and proportion can be developed within social studies; formulae are used in areas including health and wellbeing, technologies and sciences; while shape, position and movement can be developed in all areas of the curriculum.
		How is the mathematics framework structured?
		• Within the mathematics framework, some statements of experiences and outcomes are also identified as statements of experiences and outcomes in *numeracy*. These form an important part of the mathematics education of all children and young people as they include many of the numerical and analytical skills required by each of us to function effectively and successfully in everyday life.

		• The mathematics framework as a whole includes a strong emphasis on the important part mathematics has played, and will continue to play, in the advancement of society, and the relevance it has for daily life.
Chapter 3: Learning how to learn mathematics • the fundamental importance of children in primary schools learning how to learn mathematics; • the connections model for understanding number and number operations; • the processes of recognizing equivalences and identifying transformations; • the process of classification.	**My learning in mathematics enables me to:** • develop a secure understanding of the concepts, principles and processes of mathematics.	**What are the features of effective learning and teaching in mathematics?** • From the early stages onwards, children and young people should experience success in mathematics and develop the confidence to take risks, ask questions and explore alternative solutions without fear of being wrong. • Through their use of effective questioning and discussion, teachers will use misconceptions and wrong answers as opportunities to improve and deepen children's understanding of mathematical concepts. **How can I make connections within mathematics?** • Within mathematics there are rich opportunities for links among different concepts ….
Chapter 4: Key processes in mathematical reasoning • generalization; • conjecturing and checking; • the language of generalization; • counter-examples and special cases; • hypothesis and inductive reasoning; • explaining, convincing, proving and deductive reasoning; • thinking creatively in mathematics.	*(see references for Chapter 20, Algebra)*	**What are the features of effective learning and teaching in mathematics?** • (Children and young people) will enjoy exploring and applying mathematical concepts to understand and solve problems, explaining their thinking and presenting their solutions to others in a variety of ways. At all stages, an emphasis on collaborative learning will encourage children to reason logically and creatively through discussion of mathematical ideas and concepts.

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Chapter 5: Modelling and problem solving	My learning in mathematics enables me to:	What are the features of effective learning and teaching in mathematics?
• three approaches to calculations: algorithms, adhocorithms and calculators; • the key process of mathematical modelling; • the contribution of electronic calculators to this process; • interpreting answers obtained on calculators; • problem solving.	• apply skills and understanding creatively and logically to solve problems, within a variety of contexts. • appreciate how the imaginative and effective use of technologies can enhance the development of skills and concepts. **Experiences and outcomes** • Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others (second level). • I can use a variety of methods to solve number problems in familiar contexts, clearly communicating my processes and solutions. (third level). • I can solve problems by carrying out calculations with a wide range of fractions, decimal fractions and percentages, using my answers to make comparisons and informed choices for real-life situations (third level).	• Mathematics is at its most powerful when the knowledge and understanding that have been developed are used to solve problems. Problem solving will be at the heart of all our learning and teaching. We should regularly encourage children and young people to explore different options: 'what would happen if...?' is the fundamental question for teachers and learners to ask as mathematical thinking develops.
Chapter 6: Number and place value • the difference between numerals and numbers; • the cardinal and ordinal aspects of number; • natural numbers and integers; • rational, irrational and real numbers; • the Hindu-Arabic system of numeration and the principles of place value; • some contrasts with numeration systems from other cultures; • digits and powers of ten; • two ways of demonstrating place value with materials;	**Experiences and outcomes** • I am developing a sense of size and amount by observing, exploring, using and communicating with others about things in the world around me (early level). • I have explored numbers, understanding that they represent quantities, and I can use them to count, create sequences and describe order (early level). • I am developing my awareness of how money is used and can recognise and use a range of coins (early level). • I am developing my awareness of how money is used and can recognise and use a range of coins.	

• how the number line supports understanding of place value; • the role of zero as a place holder; • the extension of the place-value principle to tenths, hundredths, thousandths; • the decimal point as a separator in the contexts of money and measurement; and • locating numbers written in decimal notation on a number line.	• I have investigated how whole numbers are constructed, can understand the importance of zero within the system and can use my knowledge to explain the link between a digit, its place and its value (first level). • I have investigated how different combinations of coins and notes can be used to pay for goods or be given in change (first level). • I have extended the range of whole numbers I can work with and having explored how decimal fractions are constructed, can explain the link between a digit, its place and its value (second level). • I can show my understanding of how the number line extends to include numbers less than zero and have investigated how these numbers occur and are used (second level).	
Chapter 7: Addition and subtraction structures • two different structures of real-life problems modelled by addition; • the situations in which children will meet these structures; • the commutative law of addition; • four different structures of real-life problems modelled by subtraction; • the situations in which children will meet these structures. **Chapter 8: Mental strategies for addition and subtraction** • the associative law for addition; • counting forwards and backwards in ones, tens, hundreds; • addition and subtraction on a hundred square;	**Experiences and outcomes** • I use practical materials and can 'count on and back' to help me to understand addition and subtraction, recording my ideas and solutions in different ways (early level). • When a picture or symbol is used to replace a number in a number statement, I can find its value using my knowledge of number facts and explain my thinking to others (first level). • I can use addition and subtraction … when solving problems, making best use of the mental strategies and written skills I have developed (first level). • I can use money to pay for items and can work out how much change I should receive (first level). • I have investigated how different combinations of coins and notes can be used to pay for goods or be given in change (first level).	**How can I make connections within mathematics?** • When children and young people investigate number processes, there will be regular opportunities to develop mental strategies and mental agility.

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• using multiples of 10 and 100 as stepping stones; • addition and subtraction on an empty number line; • front-end addition and subtraction; • compensation in addition and subtraction calculations; • the correct use of the symbol for 'equals'; • using multiples of 5 in additions and subtractions; • relating additions and subtractions to doubles; • using 'friendly' numbers. **Chapter 9: Written methods for addition and subtraction** • a variety of ways of introducing column addition and subtraction; • the idea of 'carrying' in the formal addition algorithm; • the decomposition method for doing subtraction calculations; • the equal additions method for subtraction; • how the two methods differ and why decomposition is preferred; • the problem with zeros in the top number in a subtraction calculation; • the constant difference method for subtraction.	• Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others (second level). • I can manage money, compare costs from different retailers, and determine what I can afford to buy. • I can continue to recall number facts quickly and use them accurately when making calculations (third level).	
Chapter 10: Multiplication and division structures • two different structures of real-life problems modelled by multiplication; • the contexts in which children will meet these multiplication structures;	**Experiences and outcomes** • I can share out a group of items by making smaller groups and can split a whole object into smaller parts (early level).	**How can I make connections within mathematics?** • When children and young people investigate number processes, there will be regular opportunities to develop mental strategies and mental agility.

• the commutative law of multiplication; • the idea of a rectangular array associated with multiplication; • three different structures of real-life problems modelled by division; • the contexts in which children will meet these division structures. **Chapter 11: Mental strategies for multiplication and division** • the commutative, associative, distributive laws of multiplication; • quotient, dividend and divisor; • the distributive laws of division; • how these laws are used in multiplication and division calculation strategies; • some prerequisite skills for being efficient in mental multiplication and division calculations; • how factors can be used to simplify multiplications; • how doubling can be used as an ad hoc approach to multiplication; • the use of ad hoc additions and subtractions in multiplication and division; • the constant ratio method for a division calculation. **Chapter 12: Written methods for multiplication and division** • the long multiplication algorithm; • a simpler method for multiplication using areas of rectangles; • the grid method for multiplication; • the difficulty of understanding long division; • the ad hoc subtraction method of doing division calculations; • the algorithm known as short division.	• I can use … multiplication and division when solving problems, making best use of the mental strategies and written skills I have developed (first level). • Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others (second level). • I can continue to recall number facts quickly and use them accurately when making calculations (third level).	

Chapter 13: Remainders and rounding	**Experiences and outcomes**	
• the different interpretations required for the results of division calculations done on a calculator and those done by methods which produce a remainder; • the relationship between the answer with a remainder and the calculator answer; • the way in which the context determines whether to round a result up or down; • the idea of rounding to the nearest something; • how to give answers to so many decimal places or significant figures.	• I can round a number using an appropriate degree of accuracy, having taken into account the context of the problem (third level).	
Chapter 14: Multiples, factors and primes • multiples, including lowest common multiple; • some ways of spotting multiples of various numbers; • digital sums and digital roots; • factors, including highest common factor; • the transitive property of multiples and factors; • prime numbers and composite (rectangular) numbers.	**Experiences and outcomes** • Having explored the patterns and relationships in multiplication and division, I can investigate and identify the multiples and factors of numbers (second level). • I have investigated strategies for identifying common multiples and common factors, explaining my ideas to others, and can apply my understanding to solve related problems (third level). • I can apply my understanding of factors to investigate and identify when a number is prime (third level).	
Chapter 15: Squares, cubes and number shapes • square numbers; • cube numbers; • square roots and cube roots; • the trial and improvement method for finding square roots and cube roots using a calculator;	**Experiences and outcomes** • Having explored the notation and vocabulary associated with whole number powers and the advantages of writing numbers in this form, I can evaluate powers of whole numbers mentally or using technology (third level).	

• use of the inequality signs (>, <) for recording 'greater than', 'less than' and 'lies between'; • the relationship between sequences of geometric patterns and sets of numbers; • triangle numbers; • the theorem of Pythagoras	• I can compare, describe and show number relationships, using appropriate vocabulary and the symbols for equals, not equal to, less than and greater than (first level).	
Chapter 16: Integers, positive and negative • how to make sense of negative numbers; • situations in the contexts of temperatures and bank balances that are modelled by the addition and subtraction of positive and negative numbers; • how to enter negative numbers on a basic calculator.	**Experiences and outcomes** • I can use my understanding of numbers less than zero to solve simple problems in context (third level).	
Chapter 17: Fractions and ratios • four different meanings of the fraction notation: a part of a unit, a part of a set, a division, and a ratio; • some of the traditional language of fractions; • the important idea of equivalent fractions; • equivalent ratios and their use in scale drawings and maps; • simplifying fractions and ratios by cancelling; • how to compare two simple fractions; • how to add and subtract simple fractions; • how to find a simple fraction of a quantity.	**Experiences and outcomes** • Having explored fractions by taking part in practical activities, I can show my understanding of how a single item can be shared equally, the notation and vocabulary associated with fractions, and where simple fractions lie on the number line (first level). • Through exploring how groups of items can be shared equally, I can find a fraction of an amount by applying my knowledge of division (first level). • Through taking part in practical activities including use of pictorial representations, I can demonstrate my understanding of simple fractions which are equivalent (first level). • I have investigated the everyday contexts in which simple fractions, (percentages or decimal fractions) are used and can carry out the necessary calculations to solve related problems (second level).	

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	• I have investigated how a set of equivalent fractions can be created, understanding the meaning of simplest form, and can apply my knowledge to compare and order the most commonly used fractions (second level). • By applying my knowledge of equivalent fractions and common multiples, I can add and subtract commonly used fractions (third level). • Having used practical, pictorial and written methods to develop my understanding, I can convert between whole or mixed numbers and fractions (third level).	
Chapter 18: Calculations with decimals • the procedures for addition and subtraction with decimal numbers; • the contexts that might give rise to the need for calculations with decimals; • checking the reasonableness of answers by making estimates, using approximations; • multiplication and division of a decimal number by an integer, in real-life contexts; • the results of repeatedly multiplying or dividing decimal numbers by 10; • how to deal with the multiplication of two decimals; • some simple examples of division involving decimals; • converting fractions to decimals and vice versa; • recurring decimals; • scientific notation.	**Experiences and outcomes** • I can share ideas with others to develop ways of estimating the answer to a calculation or problem, work out the actual answer, then check my solution by comparing it with the estimate (first level). • I can use my knowledge of rounding to routinely estimate the answer to a problem then, after calculating, decide if my answer is reasonable, sharing my solution with others (second level). • I have explored the contexts in which problems involving decimal fractions occur and can solve related problems using a variety of methods (second level). • I have investigated the everyday contexts in which (simple fractions, percentages or) decimal fractions are used and can carry out the necessary calculations to solve related problems (second level).	

Chapter 19: Proportions and percentages	Experiences and outcomes	
Chapter 19: Proportions and percentages • how to solve simple proportion problems; • the meaning of *per cent*; • the use of percentages to express proportions of a quantity or of a set; • ad hoc and calculator methods for evaluating percentages; • the usefulness of percentages for comparing proportions; • equivalences between fractions, decimals and percentages; • the meaning of percentages greater than 100; • how to calculate a percentage of a given quantity or number, using ad hoc and calculator methods; • percentage increases and decreases.	**Experiences and outcomes** • I have investigated the everyday contexts in which simple (fractions) percentages (or decimal fractions) are used and can carry out the necessary calculations to solve related problems (second level). • I can show the equivalent forms of simple fractions, decimal fractions and percentages and can choose my preferred form when solving a problem, explaining my choice of method (second level). • I can show how quantities that are related can be increased or decreased proportionally and apply this to solve problems in everyday contexts (third level).	
Chapter 20: Algebra • the nature of algebraic thinking and the central idea of making generalizations; • the difference in the meaning of letters used as abbreviations in arithmetic and as used in algebra; • the idea of a letter representing a variable; • some other differences between arithmetic thinking and algebraic thinking; • precedence of operators; • ways of introducing children to the idea of a letter as a variable; • the important role played by tabulation; • the ideas of sequential and global generalization;	**Experiences and outcomes** • I have spotted and explored patterns in my own and the wider environment and can copy and continue these and create my own patterns (early level). • I can continue and devise more involved repeating patterns or designs, using a variety of media (first level). • Through exploring number patterns, I can recognise and continue simple number sequences and can explain the rule I have applied (first level). • Having explored more complex number sequences, including well-known named number patterns, I can explain the rule used to generate the sequence, and apply it to extend the pattern (second level).	**How is the mathematics framework structured?** • A key feature of the mathematics framework is the development of algebraic thinking from an early stage. Research shows that the earlier algebraic thinking is introduced, the deeper the mathematical understanding will be and the greater the confidence in using mathematics. **How can I make connections within mathematics?** • Teachers will make use of opportunities to develop algebraic thinking and introduce symbols, such as those opportunities afforded at early stages when reinforcing number bonds or later when investigating the sum of the angles in a triangle.

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• independent and dependent variables; • the meaning of the word 'mapping' in an algebraic context; • using spreadsheets for trial and improvement and budgeting.	• Having explored number sequences, I can establish the set of numbers generated by a given rule and determine a rule for a given sequence, expressing it using appropriate notation (third level). • I can apply my knowledge of number facts to solve problems where an unknown value is represented by a symbol or letter (second level). • Having explored the need for rules for the order of operations in number calculations, I can apply them correctly when solving simple problems (second level). • I can budget effectively, making use of technology and other methods, to manage money and plan for future expenses (second level). • Having discussed ways to express problems or statements using mathematical language, I can construct, and use appropriate methods to solve, a range of simple equations (third level). • I can create and evaluate a simple formula representing information contained in a diagram, problem or statement (third level).	
Chapter 21: Coordinates and linear relationships • how the coordinate system enables us to specify location in a plane; • axis, *x*-coordinate and *y*-coordinate, origin; • the meaning of 'quadrant' in the context of coordinates; • the difference between the coordinate system for labelling points in a plane and other systems which label spaces; • how to plot an algebraic relationship as a graph;	**Experiences and outcomes** • I have developed an awareness of where grid reference systems are used in everyday contexts and can use them to locate and describe position (first level). • I can use my knowledge of the coordinate system to plot and describe the location of a point on a grid (second and third levels).	

• linear relationships, including those where one variable is directly proportional to another; • how coordinates can be used to investigate geometric properties.		
Chapter 22: Measurement • the distinction between mass and weight; • the distinction between volume and capacity; • two aspects of the concept of time: time interval and recorded time; • the role of comparison and ordering as a foundation for measurement; • the principle of transitivity in the context of measurement; • some principles of inequalities, using the signs < and >; • conservation of length, mass and liquid volume; • non-standard and standard units; • the idea that all measurement is approximate; • the difference between a ratio scale and an interval scale; • SI and other metric units of length, mass and time, including the use of prefixes; • the importance of estimation and the use of reference items; • imperial units still in use and their relationship to metric Key Stage 1 units.	**Experiences and outcomes** • I am aware of how routines and events in my world link with times and seasons, and have explored ways to record and display these using clocks, calendars and other methods (early level). • I have experimented with everyday items as units of measure to investigate and compare sizes and amounts in my environment, sharing my findings with others (early level). • I can tell the time using 12 hour clocks, realising there is a link with 24 hour notation, explain how it impacts on my daily routine and ensure that I am organised and ready for events throughout my day (first level). • I can use a calendar to plan and be organised for key events for myself and my class throughout the year (first level). • I have begun to develop a sense of how long tasks take by measuring the time taken to complete a range of activities using a variety of timers (first level). • I can estimate how long or heavy an object is, or what amount it holds, using everyday things as a guide, then measure or weigh it using appropriate instruments and units (first level). • I can use and interpret electronic and paper-based timetables and schedules to plan events and activities, and make time calculations as part of my planning (second level).	

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	• I can carry out practical tasks and investigations involving timed events and can explain which unit of time would be most appropriate to use (second level). • I can use my knowledge of the sizes of familiar objects or places to assist me when making an estimate of measure (second level). • I can use the common units of measure, convert between related units of the metric system and carry out calculations when solving problems (second level).	
Chapter 23: Angle • the dynamic and static views of angle; • comparison and ordering of angles; • the use of turns and fractions of a turn for measuring angle; • degrees; • acute, right, obtuse, straight, reflex angles; • the sum of the angles in a triangle, aquadrilateral, and so on.	**Experiences and outcomes** • In movement, games, and using technology I can use simple directions and describe positions (early level). • I can describe, follow and record routes and journeys using signs, words and angles associated with direction and turning (first level). • I have investigated angles in the environment, and can discuss, describe and classify angles using appropriate mathematical vocabulary (second level). • I can accurately measure and draw angles using appropriate equipment, applying my skills to problems in context (second level). • Through practical activities, which include the use of technology, I have developed my understanding of the link between compass points and angles and can describe, follow and record directions, routes and journeys using appropriate vocabulary (second level).	
Chapter 24: Transformations and symmetry • transformation, equivalence and congruence in the context of shape;	**Experiences and outcomes** • I have had fun creating a range of symmetrical pictures and patterns using a range of media (early level).	

• translation, reflection and rotation as types of congruence; • scaling up and down by a scale factor in the context of shape; • similar shapes; • reflective and rotational symmetry for two-dimensional shapes.	• I have explored symmetry in my own and the wider environment and can create and recognise symmetrical pictures, patterns and shapes (first level). • I can illustrate the lines of symmetry for a range of 2D shapes and apply my understanding to create and complete symmetrical pictures and patterns (second and third levels). • I can explore and discuss how and why different shapes fit together and create a tiling pattern with them (first level). • Having investigated where, why and how scale is used and expressed, I can apply my understanding to interpret simple models, maps and plans (second level). • Having investigated navigation in the world, I can apply my understanding of bearings and scale to interpret maps and plans and create accurate plans, and scale drawings of routes and journeys (third level). • I can apply my understanding of scale when enlarging or reducing pictures and shapes, using different methods, including technology (third level).	
Chapter 25: Classifying shapes • the importance of classification as a process for making sense of the shapes in the world around us; • polygons, including the meaning of 'regular polygon'; • different kinds of triangles; • different kinds of quadrilaterals; • tessellations; • polyhedra, including the meaning of 'regular polyhedron';	**Experiences and outcomes** • I enjoy investigating objects and shapes and can sort, describe and be creative with them (early level). • I have explored simple 3D objects and 2D shapes and can identify, name and describe their features using appropriate vocabulary (first level).	

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• various three-dimensional shapes, including prisms and pyramids; • reflective symmetry applied to three-dimensional shapes.	• Having explored a range of 3D objects and 2D shapes, I can use mathematical language to describe their properties, and through investigation can discuss where and why particular shapes are used in the environment (second level). • Through practical activities, I can show my understanding of the relationship between 3D objects and their nets (second level). • I can draw 2D shapes and make representations of 3D objects using an appropriate range of methods and efficient use of resources (second level). • Having investigated a range of methods, I can accurately draw 2D shapes using appropriate mathematical instruments and methods (third level). • I can name angles and find their sizes using my knowledge of the properties of a range of 2D shapes and the angle properties associated with intersecting and parallel lines (third level).	
Chapter 26: Perimeter, area and volume • the concepts of area and perimeter; • the ideas of varying the area for a fixed perimeter, and varying the perimeter for a fixed area; • a similar idea with volume and surface area; • ways of investigating areas of parallelograms, triangles and trapeziums; • the units used for measuring area and the relationships between them; • the units used for measuring volume and the relationships between them; • the number π and its relationship to the circumference and diameter of a circle.	**Experiences and outcomes** • I can estimate the area of a shape by counting squares or other methods (first level) • I can explain how different methods can be used to find the perimeter and area of a simple 2D shape or volume of a simple 3D object (second level); • I can solve practical problems by applying my knowledge of measure, choosing the appropriate units and degree of accuracy for the task and using a formula to calculate area or volume when required (third level); • Having investigated different routes to a solution, I can find the area of compound 2D shapes and the volume of compound 3D objects, applying my knowledge to solve practical problems (third level).	**How can I make connections within mathematics?** • … investigations into area and perimeter can involve estimation, patterns and relationships and a variety of numbers.

Chapter 27: Handling data	My learning in mathematics enables me to:	How is the mathematics framework structured?
- sorting data according to various criteria and the use of Venn diagrams and Carroll diagrams; - universal set, subset, complement of a set, intersection of sets; - population, variable, and values of a variable in the context of statistical data; - the four stages of handling data: collecting, organizing, representing, interpreting; - the use of tallying and frequency tables for collecting and organizing data; - the idea of sampling when undertaking a survey of a large population; - the differences between discrete data, grouped discrete data and continuous data; - the representation of discrete data in block graphs; - the representation of discrete and grouped discrete data in bar charts; - the misleading effect of suppressing zero in a frequency graph; - other ways of representing data: pictograms, pie charts, line graphs and scatter diagrams.	- interpret numerical information appropriately and use it to draw conclusions, assess risk, and make reasoned evaluations and informed decisions. **Experiences and outcomes** - I can collect objects and ask questions to gather information, organising and displaying my findings in different ways (early level). - I can match objects, and sort using my own and others' criteria, sharing my ideas with others (early level). - I can use the signs and charts around me for information, helping me plan and make choices and decisions in my daily life (early level). - I have explored a variety of ways in which data is presented and can ask and answer questions about the information it contains (first level). - I have used a range of ways to collect information and can sort it in a logical, organised and imaginative way using my own and others' criteria (first level). - Using technology and other methods, I can display data simply, clearly and accurately by creating tables, charts and diagrams, using simple labelling and scale (first level). - Having discussed the variety of ways and range of media used to present data, I can interpret and draw conclusions from the information displayed, recognising that the presentation may be misleading (second level). - I have carried out investigations and surveys, devising and using a variety of methods to gather information and have worked with others to *collate,* organise and communicate the results in an appropriate way (second level).	Teachers will use the statements of experiences and outcomes in information handling to emphasise the interpretation of statistical information in the world around us …

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	• I can display data in a clear way using a suitable scale, by choosing appropriately from an extended range of tables, charts, diagrams and graphs, making effective use of technology (second and third levels). • I can work collaboratively, making appropriate use of technology, to source information presented in a range of ways, interpret what it conveys and discuss whether I believe the information to be robust, vague or misleading (third level). • When analysing information or collecting data of my own, I can use my understanding of how bias may arise and how sample size can affect precision, to ensure that the data allows for fair conclusions to be drawn (third level).	
Chapter 28: Comparing sets of data • how two data sets using the same variable can be presented for comparison; • the idea of an average as a representative figure for a set of data; • three measures of average: the mean, the median and the mode; • how to calculate mode, median and mean from a frequency table; • quartiles and the five-number summary of a distribution; • range and inter-quartile range as measures of spread; • box-and-whisker diagrams; • percentiles and deciles; • the concept of average speed.	**Experiences and outcomes** • Using simple time periods, I can give a good estimate of how long a journey should take, based on my knowledge of the link between time, speed and distance (third level). • [In order to compare numerical information in real-life contexts, I can find the mean, median, mode and range of sets of numbers, decide which type of average is most appropriate to use and discuss how using an alternative type of average could be misleading (fourth level).]	
Chapter 29: Probability • the meaning of probability as a measurement applied to events; • some of the language we use to indicate probability subjectively;	**Experiences and outcomes** • I can use appropriate vocabulary to describe the likelihood of events occurring, using the knowledge and experiences of myself and others to guide me (first level).	**How is the mathematics framework structured?** • Teachers will use the statements of experiences and outcomes in information

• the use of a numerical scale from 0 to 100%, or from 0 to 1, for measuring probability; • estimating probability from statistical data; • estimating probability from data obtained by repeating an experiment a large number of times; • estimating probability by using theoretical arguments based on symmetry and equally likely outcomes; • the use of two-way tables for identifying all the possible equally likely outcomes from an experiment involving two independent events; • mutually exclusive events; • rules for combining probabilities for independent and mutually exclusive events; • a simple model for assessing risk.	• I can conduct simple experiments involving chance and communicate my predictions and findings using the vocabulary of probability (second level). • I can find the probability of a simple event happening and explain why the consequences of the event, as well as its probability, should be considered when making choices (third level).	handling … to emphasise the knowledge and skills required to take account of chance and uncertainty when making decisions.