

<p><b>Content of Mathematics Explained for Primary Teachers, 4th edition.</b></p> <p><b>Chapter 2: Mathematics in the primary curriculum</b></p> <ul style="list-style-type: none"> <li>the different kinds of reason for teaching mathematics in the primary school;</li> <li>the contribution of mathematics to everyday life and society;</li> <li>the contribution of mathematics to other areas of the curriculum;</li> <li>the contribution of mathematics to the learner's intellectual development;</li> <li>the importance of mathematics in promoting enjoyment of learning;</li> <li>how mathematics is important as a distinctive form of knowledge;</li> <li>how the essential content of the primary curriculum in England is not just about knowledge and skills but also about using and applying mathematics;</li> <li>the various components of using and applying mathematics in the primary curriculum in England;</li> <li>the relationship of numeracy to mathematical understanding.</li> </ul>	<p><b>DFEE/QCA (1999) The National Curriculum Handbook for Primary Teachers in England. Mathematics (pages 60–74): Key Stages 1 and 2.</b></p> <p><b>The importance of mathematics</b></p> <ul style="list-style-type: none"> <li>Mathematics equips pupils with a uniquely powerful set of tools to understand and change the world.</li> <li>These tools include logical reasoning, problem-solving skills, and the ability to think in abstract ways.</li> <li>Mathematics is important in everyday life, many forms of employment, science and technology, medicine, the economy, the environment and development, and in public decision-making.</li> <li>Different cultures have contributed to the development and application of mathematics.</li> <li>Today, the subject transcends cultural boundaries and its importance is universally recognised.</li> <li>Mathematics is a creative discipline. It can stimulate moments of pleasure and wonder when a pupil solves a problem for the first time, discovers a more elegant solution to that problem, or suddenly sees hidden connections.</li> </ul> <p><b>Key Stage 2 Breadth of study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>using mathematics in their work in other subjects.</li> </ul>	<p><b>QCDA (2010) The National Curriculum Level Descriptions for Subjects. Mathematics: Levels 2–5.</b></p>
<p><b>Chapter 3: Learning how to learn mathematics</b></p> <ul style="list-style-type: none"> <li>the fundamental importance of children in primary schools learning how to learn mathematics;</li> </ul>	<p><b>Knowledge, skills and understanding</b></p> <ul style="list-style-type: none"> <li>Teaching should ensure that appropriate connections are made between the sections on number, shape, space and measures, and handling data.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>discuss their work using mathematical language and begin to represent it using symbols and simple diagrams (AT1, level 2);</li> </ul>

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<ul style="list-style-type: none"> <li>the connections model for understanding number and number operations;</li> <li>the processes of recognizing equivalences and identifying transformations;</li> <li>the process of classification.</li> </ul>	<p><b>Key Stage 1</b>  <b>Breadth of Study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>using mathematical ideas in practical activities, then recording these using objects, pictures, diagrams, words, numbers and symbols;</li> <li>activities that encourage them to make connections between number work and other aspects of their work in mathematics.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>communicate in spoken, pictorial and written form, at first using informal language and recording, then mathematical language and symbols;</li> <li>recognise that if objects are rearranged the number stays the same;</li> <li>use the symbol '=' to represent equality.</li> </ul> <p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>make connections in mathematics and appreciate the need to use numerical skills and knowledge when solving problems in other parts of the mathematics curriculum.</li> </ul>	<ul style="list-style-type: none"> <li>sort objects and classify them using more than one criterion (AT4, level 2);</li> <li>classify 3-D and 2-D shapes in various ways using mathematical properties (AT3, level 3);</li> <li>use and interpret mathematical symbols and diagrams (AT1, level 3);</li> <li>show understanding of situations by describing them mathematically using symbols, words and diagrams (AT1, level 5).</li> </ul>
<p><b>Chapter 4: Key processes in mathematical reasoning</b></p> <ul style="list-style-type: none"> <li>generalization;</li> <li>conjecturing and checking;</li> <li>the language of generalization;</li> <li>counter-examples and special cases;</li> <li>hypothesis and inductive reasoning;</li> <li>explaining, convincing, proving and deductive reasoning;</li> <li>thinking creatively in mathematics.</li> </ul>	<p><b>Key Stage 1</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>present results in an organised way;</li> <li>understand a general statement and investigate whether particular cases match it;</li> <li>explain their methods and reasoning when solving problems involving number and data;</li> <li>use mathematical communication and explanation skills.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>explain why an answer is correct (AT1, level 2);</li> <li>discuss their mathematical work and begin to explain their thinking (AT1, level 3);</li> <li>show that they understand a general statement by finding particular examples that match it. (AT1, level 3);</li> </ul>

<ul style="list-style-type: none"> <li>• counter-examples and special cases;</li> <li>• hypothesis and inductive reasoning;</li> <li>• explaining, convincing, proving and deductive reasoning;</li> <li>• thinking creatively in mathematics.</li> </ul>	<p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• understand and investigate general statements;</li> <li>• search for pattern in their results; develop logical thinking and explain their reasoning;</li> <li>• use mathematical reasoning to explain features of shape and space;</li> <li>• use notation diagrams and symbols correctly within a given problem;</li> <li>• communicate mathematically, including the use of precise mathematical language.</li> </ul>	<ul style="list-style-type: none"> <li>• look for patterns and relationships, presenting information and results in a clear and organised way, using ICT appropriately (AT1, level 4);</li> <li>• draw simple conclusions of their own and explain their reasoning (AT1, level 4).</li> </ul>
<p><b>Chapter 5: Modelling and problem solving</b></p> <ul style="list-style-type: none"> <li>• three approaches to calculations: algorithms, adhocorithms and calculators;</li> <li>• the key process of mathematical modelling;</li> <li>• the contribution of electronic calculators to this process;</li> <li>• interpreting answers obtained on calculators;</li> <li>• problem solving.</li> </ul>	<p><b>Key Stage 1</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• choose sensible calculation methods to solve whole-number problems (including problems involving money or measures), drawing on their understanding of the operations;</li> <li>• choose and use an appropriate way to calculate and explain their methods and reasoning;</li> <li>• check that their answers are reasonable and explain their methods or reasoning;</li> <li>• approach problems involving number, and data presented in a variety of forms, in order to identify what they need to do;</li> <li>• choose suitable number operations to solve a given problem, and recognise similar problems to which they apply;</li> <li>• develop flexible approaches to problem solving and look for ways to overcome difficulties;</li> <li>• make decisions about which operations and problem-solving strategies to use;</li> <li>• organise and check their work;</li> <li>• try different approaches and find ways of overcoming difficulties when solving shape and space problems.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• select the mathematics they use in some classroom activities (AT1, level 2);</li> <li>• try different approaches and find ways of overcoming difficulties that arise when they are solving problems (AT1, level 3);</li> <li>• are beginning to organise their work and check results (AT1, level 3);</li> <li>• develop their own strategies for solving problems and use these strategies both in working within mathematics and in applying mathematics to practical contexts (AT1, level 4);</li> <li>• when solving problems, with or without ICT, check their results are reasonable by considering the context (AT1, level 4);</li> <li>• search for a solution by trying out ideas of their own (AT1, level 4);</li> </ul>

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	<p><b>Key Stage 2</b>  <b>Breadth of study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>• activities in which pupils decide when the use of calculators is appropriate and then use them effectively .</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• use a calculator to solve number problems; know how to enter and interpret money calculations and fractions; know how to select the correct key sequence for calculations with more than one operation;</li> <li>• break down a more complex problem or calculation into simpler steps before attempting a solution;</li> <li>• identify the information needed to carry out the tasks;</li> <li>• select and use appropriate mathematical equipment, including ICT;</li> <li>• find different ways of solving a problem in order to overcome any difficulties;</li> <li>• make mental estimates of the answers to calculations and check results;</li> <li>• organise work and refine ways of recording;</li> <li>• present and interpret solutions in the context of the problem;</li> <li>• estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy;</li> <li>• choose, use and combine any of the four number operations to solve word problems involving number in 'real life', money or measures.</li> </ul>	<ul style="list-style-type: none"> <li>• in order to explore mathematical situations, carry out tasks or tackle problems, identify the mathematical aspects and obtain necessary information (AT1, level 5);</li> <li>• calculate accurately, using ICT where appropriate (AT1, level 5);</li> <li>• check their working and results, considering whether these are sensible (AT1, level 5).</li> </ul>
<p><b>Chapter 6: Number and place value</b></p> <ul style="list-style-type: none"> <li>• the difference between numerals and numbers;</li> <li>• the cardinal and ordinal aspects of number;</li> <li>• natural numbers and integers</li> <li>• rational, irrational and real numbers</li> </ul>	<p><b>Key Stage 1</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• use the correct language, symbols and vocabulary associated with number;</li> <li>• count reliably up to 20 at first, be familiar with the numbers 11 to 20 and gradually extend counting to 100 and beyond;</li> <li>• read and write numbers to 20 at first and then to 100 or beyond;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• count sets of objects reliably (AT2, level 2);</li> <li>• begin to understand the place value of each digit in a number and use this to order numbers up to 100 (AT2, level 2);</li> </ul>

<ul style="list-style-type: none"> <li>the Hindu-Arabic system of numeration and the principles of place value;</li> <li>some contrasts with numeration systems from other cultures;</li> <li>digits and powers of ten;</li> <li>two ways of demonstrating place value with materials;</li> <li>how the number line supports understanding of place value;</li> <li>the role of zero as a place holder;</li> <li>the extension of the place-value principle to tenths, hundredths, thousandths;</li> <li>the decimal point as a separator in the contexts of money and measurement; and</li> <li>locating numbers written in decimal notation on a number line.</li> </ul>	<ul style="list-style-type: none"> <li>understand the vocabulary of comparing and ordering these numbers;</li> <li>recognise that the position of a digit gives its value and know what each digit represents, including zero as a place-holder;</li> <li>order a set of one- and two-digit numbers and position them on a number line and hundred square.</li> </ul> <p><b>Key Stage 2</b></p> <p><b>Breadth of study</b></p> <p><b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>activities that extend their understanding of the number system to include integers, fractions and decimals.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>read, write and order whole numbers, recognizing that the position of a digit gives its value;</li> <li>count on or back in tens or hundreds from any two- or three-digit number;</li> <li>recognise and continue number sequences formed by counting on or back in steps of constant size from any integer, extending to negative integers when counting back;</li> <li>understand and use decimal notation for tenths and hundredths in context;</li> <li>locate on a number line and order a set of numbers or measurements (using tenths and hundredths);</li> <li>recognize thousandths (in metric measures);</li> <li>convert between centimetres and millimetres or metres, then between millimetres and metres, and metres and kilometres, explaining methods and reasoning.</li> </ul>	<ul style="list-style-type: none"> <li>show understanding of place value in numbers up to 1000 (AT2, level 3);</li> <li>begin to use decimal notation, in the context of measures and money (AT2, level 3).</li> </ul>
<p><b>Chapter 7: Addition and subtraction structures</b></p> <ul style="list-style-type: none"> <li>two different structures of real-life problems modelled by addition;</li> <li>the situations in which children will meet these structures;</li> <li>the commutative law of addition;</li> </ul>	<p><b>Key Stage 1</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>understand addition and use related vocabulary;</li> <li>recognise that addition can be done in any order;</li> <li>understand subtraction as both 'take away' and 'difference' and use the related vocabulary;</li> <li>recognise that subtraction is the inverse of addition;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>choose the appropriate operation when solving addition and subtraction problems (AT2, level 2);</li> <li>use the knowledge that subtraction is the inverse of addition (AT2, level 2).</li> </ul>

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<ul style="list-style-type: none"> <li>• four different structures of real-life problems modelled by subtraction;</li> <li>• the situations in which children will meet these structures.</li> </ul>	<ul style="list-style-type: none"> <li>• give the subtraction corresponding to an addition and vice versa;</li> <li>• solve missing number problems [for example, <math>6 = 2 + ?</math>].</li> </ul>	
<p><b>Chapter 8: Mental strategies for addition and subtraction</b></p> <ul style="list-style-type: none"> <li>• the associative law for addition;</li> <li>• counting forwards and backwards in ones, tens, hundreds;</li> <li>• addition and subtraction on a hundred square;</li> <li>• using multiples of 10 and 100 as stepping stones;</li> <li>• addition and subtraction on an empty number line;</li> <li>• front-end addition and subtraction;</li> <li>• compensation in addition and subtraction calculations;</li> <li>• the correct use of the symbol for 'equals';</li> <li>• using multiples of 5 in additions and subtractions;</li> <li>• relating additions and subtractions to doubles;</li> <li>• using 'friendly' numbers.</li> </ul>	<p><b>Key Stage 1</b>  <b>Breadth of study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>• using mental images of numbers and their relationships to support the development of mental calculation strategies.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• develop rapid recall of number facts;</li> <li>• know addition and subtraction facts to 10 and use these to derive facts with totals to 20;</li> <li>• develop a range of mental methods for finding, from known facts, those that they cannot recall, including adding 10 to any single-digit number, then adding and subtracting a multiple of 10 to or from a two-digit number;</li> <li>• develop a variety of methods for adding and subtracting, including making use of the facts that addition can be done in any order and that subtraction is the inverse of addition;</li> <li>• carry out simple calculations of the form <math>40 + 30 = ?</math>, <math>40 + ? = 100</math>, <math>56 - ? = 10</math>;</li> <li>• record calculations in a number sentence, using the symbols <math>+</math>, <math>-</math>, <math>=</math> correctly.</li> </ul> <p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• understand why the commutative and associative laws apply to addition and how they can be used to do mental and written calculations more efficiently;</li> <li>• recall all addition and subtraction facts for each number to 20;</li> <li>• work out what they need to add to any two-digit number to make 100, then add or subtract any pair of two-digit whole numbers;</li> <li>• handle particular cases of three-digit and four-digit additions and subtractions by using compensation or other methods.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• use mental recall of addition and subtraction facts to 10 (AT2, level 2);</li> <li>• use mental calculation strategies to solve number problems involving money and measures (AT2, level 2);</li> <li>• use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers (AT2, level 3);</li> <li>• add and subtract numbers with two digits mentally (AT2, level 3);</li> <li>• select efficient strategies for addition and subtraction (AT2, level 4).</li> </ul>

<p><b>Chapter 9: Written methods for addition and subtraction</b></p> <ul style="list-style-type: none"> <li>• a variety of ways of introducing column addition and subtraction;</li> <li>• the idea of ‘carrying’ in the formal addition algorithm;</li> <li>• the decomposition method for doing subtraction calculations;</li> <li>• the equal additions method for subtraction;</li> <li>• how the two methods differ and why decomposition is preferred;</li> <li>• the problem with zeros in the top number in a subtraction calculation;</li> <li>• the constant difference method for subtraction.</li> </ul>	<p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• use written methods to add and subtract positive integers less than 1000, then up to 10,000.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• add and subtract numbers with three digits using written methods (AT2, level 3);</li> <li>• select efficient strategies for addition and subtraction (AT2, level 4).</li> </ul>
<p><b>Chapter 10: Multiplication and division structures</b></p> <ul style="list-style-type: none"> <li>• two different structures of real-life problems modelled by multiplication;</li> <li>• the contexts in which children will meet these multiplication structures;</li> <li>• the commutative law of multiplication;</li> <li>• the idea of a rectangular array associated with multiplication;</li> <li>• three different structures of real-life problems modelled by division;</li> <li>• the contexts in which children will meet these division structures.</li> </ul>	<p><b>Key Stage 1</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• understand multiplication as repeated addition;</li> <li>• understand that halving is the inverse of doubling;</li> <li>• begin to understand division as grouping (repeated subtraction);</li> <li>• use vocabulary associated with multiplication and division;</li> <li>• recognise the relationship between halving and doubling;</li> </ul> <p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• develop further their understanding of the four number operations and the relationships between them including inverses; use the related vocabulary.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• solve whole-number problems involving multiplication or division (AT2, level 3).</li> </ul>
<p><b>Chapter 11: Mental strategies for multiplication and division</b></p> <ul style="list-style-type: none"> <li>• the commutative, associative, distributive laws of multiplication;</li> </ul>	<p><b>Key Stage 1</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• know multiplication facts for the <math>\cdot 2</math> and <math>\cdot 10</math> multiplication tables and derive corresponding division facts, know doubles of numbers to 10 and halves of even numbers to 20;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• use mental recall of the 2, 3, 4, 5 and 10 multiplication tables and derive the associated division facts (AT2, level 3);</li> </ul>

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<ul style="list-style-type: none"> <li>• quotient, dividend and divisor;</li> <li>• the distributive laws of division;</li> <li>• how these laws are used in multiplication and division calculation strategies;</li> <li>• some prerequisite skills for being efficient in mental multiplication and division calculations;</li> <li>• how factors can be used to simplify multiplications;</li> <li>• how doubling can be used as an ad hoc approach to multiplication;</li> <li>• the use of ad hoc additions and subtractions in multiplication and division;</li> <li>• the constant ratio method for a division calculation.</li> </ul>	<ul style="list-style-type: none"> <li>• record calculations in a number sentence, using the symbols <math>\cdot</math>, <math>\div</math>, = correctly.</li> </ul> <p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• multiply and divide any integer by 10 or 100 then extend to multiplying and dividing by 1000;</li> <li>• understand why the commutative, associative and distributive laws apply to multiplication and how they can be used to do mental and written calculations more efficiently;</li> <li>• recall multiplication facts to <math>10 \cdot 10</math> and use them to derive quickly the corresponding division facts;</li> <li>• double and halve any two-digit number;</li> <li>• multiply and divide, at first in the range 1 to 100 then for particular cases of larger numbers by using factors, distribution or other methods.</li> </ul>	<ul style="list-style-type: none"> <li>• use their understanding of place value to mentally multiply and divide whole numbers by 10 or 100 (AT2, level 4);</li> <li>• when solving number problems, use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to <math>10 \cdot 10</math> and quick derivation of corresponding division facts (AT2, level 4);</li> <li>• select efficient strategies for multiplication and division (AT2, level 4).</li> </ul>
<p><b>Chapter 12: Written methods for multiplication and division</b></p> <ul style="list-style-type: none"> <li>• the long multiplication algorithm;</li> <li>• a simpler method for multiplication using areas of rectangles;</li> <li>• the grid method for multiplication;</li> <li>• the difficulty of understanding long division;</li> <li>• the ad hoc subtraction method of doing division calculations;</li> <li>• the algorithm known as short division.</li> </ul>	<p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• use written methods for short multiplication and division by a single-digit integer of two-digit then three-digit then four-digit integers;</li> <li>• then use long multiplication, at first for two-digit by two-digit integer calculations, then for three-digit by two-digit calculations;</li> <li>• extend division to informal methods of dividing by a two-digit divisor;</li> <li>• use approximations and other strategies to check that their answers are reasonable.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• select efficient strategies for multiplication and division (AT2, level 4).</li> </ul>
<p><b>Chapter 13: Remainders and rounding</b></p> <ul style="list-style-type: none"> <li>• the different interpretations required for the results of division calculations done on a calculator and those done by methods which produce a remainder;</li> </ul>	<p><b>Key Stage 1</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• round any two-digit number to the nearest 10.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• use understanding of place value in numbers up to 1000 to make approximations (AT2, level 3);</li> </ul>



<ul style="list-style-type: none"> <li>the relationship between the answer with a remainder and the calculator answer;</li> <li>the way in which the context determines whether to round a result up or down;</li> <li>the idea of rounding to the nearest something;</li> <li>how to give answers to so many decimal places or significant figures.</li> </ul>	<p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>round integers to the nearest 100 and then 1000;</li> <li>round a number with one or two decimal places to the nearest integer or tenth;</li> <li>find remainders after division, then express a quotient as a fraction or decimal;</li> <li>round up or down after division, depending on the context.</li> </ul>	<ul style="list-style-type: none"> <li>solve whole-number problems involving division that give rise to remainders (AT2, level 3).</li> </ul>
<p><b>Chapter 14: Multiples, factors and primes</b></p> <ul style="list-style-type: none"> <li>multiples, including lowest common multiple;</li> <li>some ways of spotting multiples of various numbers;</li> <li>digital sums and digital roots;</li> <li>factors, including highest common factor;</li> <li>the transitive property of multiples and factors;</li> <li>prime numbers and composite (rectangular) numbers.</li> </ul>	<p><b>Key Stage 1</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>create and describe number patterns;</li> <li>explore and record patterns related to addition and subtraction, and then patterns of multiples of 2, 5 and 10.</li> </ul> <p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>recognize and describe number patterns, including two- and three-digit multiples of 2, 5 or 10;</li> <li>recognize prime numbers to 20;</li> <li>find factor pairs and all the prime factors of any two-digit whole number.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>look for patterns and relationships (AT1, level 4).</li> </ul>
<p><b>Chapter 15: Squares, cubes and number shapes</b></p> <ul style="list-style-type: none"> <li>square numbers;</li> <li>cube numbers;</li> <li>square roots and cube roots;</li> <li>the trial and improvement method for finding square roots and cube roots using a calculator;</li> <li>use of the inequality signs (<math>&gt;</math>, <math>&lt;</math>) for recording 'greater than', 'less than' and 'lies between';</li> <li>the relationship between sequences of geometric patterns and sets of numbers;</li> <li>triangle numbers;</li> <li>the theorem of Pythagoras.</li> </ul>	<p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>recognize square numbers up to <math>10^2</math>;</li> <li>use correctly the symbols <math>&lt;</math>, <math>&gt;</math>, <math>=</math>.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>recognise sequences of numbers ... (AT2, level 2);</li> <li>look for patterns and relationships ... (AT1, level 4).</li> </ul>

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<p><b>Chapter 16: Integers, positive and negative</b></p> <ul style="list-style-type: none"> <li>• how to make sense of negative numbers;</li> <li>• situations in the contexts of temperatures and bank balances that are modelled by the addition and subtraction of positive and negative numbers;</li> <li>• how to enter negative numbers on a basic calculator.</li> </ul>	<p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• order a set of negative integers, explaining methods and reasoning.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• begin to recognise negative numbers in practical contexts such as temperature (AT2, level 3);</li> <li>• order, add and subtract negative numbers in context (AT2, level 5).</li> </ul>
<p><b>Chapter 17: Fractions and ratios</b></p> <ul style="list-style-type: none"> <li>• four different meanings of the fraction notation: a part of a unit, a part of a set, a division, and a ratio;</li> <li>• some of the traditional language of fractions;</li> <li>• the important idea of equivalent fractions;</li> <li>• equivalent ratios and their use in scale drawings and maps;</li> <li>• simplifying fractions and ratios by cancelling;</li> <li>• how to compare two simple fractions;</li> <li>• how to add and subtract simple fractions;</li> <li>• how to find a simple fraction of a quantity.</li> </ul>	<p><b>Key Stage 1</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• find one half and one quarter of shapes and small numbers of objects.</li> </ul> <p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• understand unit fractions then fractions that are several parts of one whole;</li> <li>• locate them on a number line and use them to find fractions of shapes and quantities;</li> <li>• understand simple equivalent fractions and simplify fractions by cancelling common factors;</li> <li>• compare and order simple fractions by converting them to fractions with a common denominator, explaining their methods and reasoning;</li> <li>• recognise approximate proportions of a whole and use simple fractions to describe them, explaining their methods and reasoning;</li> <li>• solve simple problems involving ratio.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent (AT2, level 3);</li> <li>• recognise approximate proportions of a whole and use simple fractions to describe these (AT2, level 4);</li> <li>• solve simple problems involving ratio (AT2, level 5);</li> <li>• calculate fractional parts of quantities and measurements, using a calculator where appropriate (AT2, level 5).</li> </ul>
<p><b>Chapter 18: Calculations with decimals</b></p> <ul style="list-style-type: none"> <li>• the procedures for addition and subtraction with decimal numbers;</li> <li>• the contexts that might give rise to the need for calculations with decimals;</li> </ul>	<p><b>Key Stage 2</b> <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• add and subtract numbers involving decimals;</li> <li>• recognise the equivalence between the decimal and fraction forms of one half, quarters, tenths and hundredths;</li> <li>• use written methods for short multiplication and division of numbers with decimals;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• use their understanding of place value to multiply and divide whole numbers and decimals (AT2, level 5);</li> </ul>

<ul style="list-style-type: none"> <li>• checking the reasonableness of answers by making estimates, using approximations;</li> <li>• multiplication and division of a decimal number by an integer, in real-life contexts;</li> <li>• the results of repeatedly multiplying or dividing decimal numbers by 10;</li> <li>• how to deal with the multiplication of two decimals;</li> <li>• some simple examples of division involving decimals;</li> <li>• converting fractions to decimals and vice versa;</li> <li>• recurring decimals;</li> <li>• scientific notation.</li> </ul>	<ul style="list-style-type: none"> <li>• use a calculator for calculations involving several digits, including decimals;</li> <li>• use approximations and other strategies to check that their answers are reasonable.</li> </ul>	<ul style="list-style-type: none"> <li>• use all four operations with decimals to two places (AT2, level 5).</li> </ul>
<p><b>Chapter 19: Proportions and percentages</b></p> <ul style="list-style-type: none"> <li>• how to solve simple proportion problems;</li> <li>• the meaning of <i>per cent</i>;</li> <li>• the use of percentages to express proportions of a quantity or of a set;</li> <li>• ad hoc and calculator methods for evaluating percentages;</li> <li>• the usefulness of percentages for comparing proportions;</li> <li>• equivalences between fractions, decimals and percentages;</li> <li>• the meaning of percentages greater than 100;</li> <li>• how to calculate a percentage of a given quantity or number, using ad hoc and calculator methods;</li> <li>• percentage increases and decreases.</li> </ul>	<p><b>Key Stage 2</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• understand that 'percentage' means the 'number of parts per 100' and that it can be used for comparisons;</li> <li>• find percentages of whole number quantities, using a calculator where appropriate;</li> <li>• recognise approximate proportions of a whole and use simple fractions and percentages to describe them, explaining their methods and reasoning;</li> <li>• solve simple problems involving direct proportion.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• recognise approximate proportions of a whole and use simple percentages to describe these (AT2, level 4);</li> <li>• solve simple problems involving direct proportion (AT2, level 5);</li> <li>• calculate percentage parts of quantities and measurements, using a calculator where appropriate (AT2, level 5).</li> </ul>

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<p><b>Chapter 20: Algebra</b></p> <ul style="list-style-type: none"> <li>the nature of algebraic thinking and the central idea of making generalizations;</li> <li>the difference in the meaning of letters used as abbreviations in arithmetic and as used in algebra;</li> <li>the idea of a letter representing a variable;</li> <li>some other differences between arithmetic thinking and algebraic thinking;</li> <li>precedence of operators;</li> <li>ways of introducing children to the idea of a letter as a variable;</li> <li>the important role played by tabulation;</li> <li>the ideas of sequential and global generalization;</li> <li>independent and dependent variables;</li> <li>the meaning of the word 'mapping' in an algebraic context;</li> <li>using spreadsheets for trial and improvement and budgeting.</li> </ul>	<p><b>Key Stage 1</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>recognise sequences, including odd and even numbers to 30 then beyond.</li> </ul> <p><b>Key Stage 2</b></p> <p><b>Breadth of study</b></p> <p><b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>using patterns and relationships to explore simple algebraic ideas.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>recognise and describe number patterns, including two- and three-digit multiples of 2, 5 or 10, recognising their patterns and using these to make predictions;</li> <li>make general statements, using words to describe a functional relationship, and test these;</li> <li>understand the use of brackets to determine the order of operations;</li> <li>recognise, represent and interpret simple number relationships, constructing and using formulae in words then symbols.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>recognise sequences of numbers, including odd and even numbers (AT2, level 2);</li> <li>begin to use simple formulae expressed in words (AT2, level 4);</li> <li>construct, express in symbolic form and use simple formulae involving one or two operations (AT2, level 5);</li> <li>use brackets appropriately (AT2, level 5).</li> </ul>
<p><b>Chapter 21: Coordinates and linear relationships</b></p> <ul style="list-style-type: none"> <li>how the coordinate system enables us to specify location in a plane;</li> <li>axis, <math>x</math>-coordinate and <math>y</math>-coordinate, origin;</li> <li>the meaning of 'quadrant' in the context of coordinates;</li> <li>the difference between the coordinate system for labelling points in a plane and other systems which label spaces;</li> <li>how to plot an algebraic relationship as a graph;</li> </ul>	<p><b>Key Stage 2</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>read and plot coordinates in the first quadrant, then in all four quadrants;</li> <li>locate and draw shapes using coordinates in the first quadrant, then in all four quadrants.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>use and interpret coordinates in all four quadrants (AT2, level 5).</li> </ul>

<ul style="list-style-type: none"> <li>linear relationships, including those where one variable is directly proportional to another;</li> <li>how coordinates can be used to investigate geometric properties.</li> </ul>	<p><b>Chapter 22: Measurement</b></p> <ul style="list-style-type: none"> <li>the distinction between mass and weight;</li> <li>the distinction between volume and capacity;</li> <li>two aspects of the concept of time: time interval and recorded time;</li> <li>the role of comparison and ordering as a foundation for measurement;</li> <li>the principle of transitivity in the context of measurement;</li> <li>some principles of inequalities, using the signs <math>&lt;</math> and <math>&gt;</math>;</li> <li>conservation of length, mass and liquid volume;</li> <li>non-standard and standard units;</li> <li>the idea that all measurement is approximate;</li> <li>the difference between a ratio scale and an interval scale;</li> <li>SI and other metric units of length, mass and time, including the use of prefixes;</li> <li>the importance of estimation and the use of reference items;</li> <li>imperial units still in use and their relationship to metric Key Stage 1 units.</li> </ul>	<p><b>Key Stage 1</b>  <b>Breadth of study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>practical activity, exploration and discussion;</li> <li>estimating, drawing and measuring in a range of practical contexts.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>use the correct language and vocabulary for measures;</li> <li>estimate the size of objects and order them by direct comparison using appropriate language;</li> <li>put familiar events in chronological order;</li> <li>compare and measure objects using uniform non-standard units, then with a standard unit of length (cm, m), weight (kg), capacity (litre);</li> <li>compare the durations of events using a standard unit of time;</li> <li>estimate, measure and weigh objects; choose and use simple measuring instruments, reading and interpreting numbers, and scales to the nearest labelled division;</li> <li>select and use appropriate mathematical equipment when solving problems involving measures or measurement.</li> </ul> <p><b>Key Stage 2</b>  <b>Breadth of study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>approximating and estimating more systematically in their work in mathematics;</li> <li>applying their measuring skills in a range of contexts.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>recognise the need for standard units of length, mass and capacity; choose which ones are suitable for a task, and use them to make sensible estimates in everyday situations;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>begin to use everyday non-standard and standard units to measure length and mass (AT3, level 2);</li> <li>use non-standard units, standard metric units of length, capacity and mass, and standard units of time, in a range of contexts (AT3, level 3);</li> <li>use standard metric units of length (AT3, level 3);</li> <li>choose and use appropriate units and tools, interpreting, with appropriate accuracy, numbers on a range of measuring instruments (AT3, level 4);</li> <li>convert one metric unit to another (AT3, level 5);</li> <li>make sensible estimates of a range of measures in relation to everyday situations (AT3, level 5).</li> </ul>
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<p><b>Chapter 23: Angle</b></p> <ul style="list-style-type: none"> <li>the dynamic and static views of angle;</li> <li>comparison and ordering of angles;</li> <li>the use of turns and fractions of a turn for measuring angle;</li> <li>degrees;</li> <li>acute, right, obtuse, straight, reflex angles;</li> <li>the sum of the angles in a triangle, a quadrilateral, and so on.</li> </ul>	<ul style="list-style-type: none"> <li>convert one metric unit to another;</li> <li>know the rough metric equivalents of imperial units still in daily use;</li> <li>recognise that measurement is approximate;</li> <li>choose and use suitable measuring instruments for a task;</li> <li>interpret numbers and read scales with increasing accuracy;</li> <li>record measurements using decimal notation;</li> <li>read the time from analogue and digital 12- and 24-hour clocks; use units of time – seconds, minutes, hours, days, weeks – and know the relationship between them.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>recognise angle as a measurement of turn, and right angles in turns (AT3, level 2);</li> <li>when constructing models and drawing or using shapes, measure and draw angles to the nearest degree and use language associated with angles (AT3, level 5);</li> <li>know the angle sum of a triangle and that of angles at a point (AT3, level 5).</li> </ul>
<p><b>Chapter 23: Angle</b></p> <ul style="list-style-type: none"> <li>the dynamic and static views of angle;</li> <li>comparison and ordering of angles;</li> <li>the use of turns and fractions of a turn for measuring angle;</li> <li>degrees;</li> <li>acute, right, obtuse, straight, reflex angles;</li> <li>the sum of the angles in a triangle, a quadrilateral, and so on.</li> </ul>	<p><b>Key Stage 1</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>understand angle as a measure of turn using whole turns, half-turns and quarter-turns;</li> <li>recognise right angles.</li> </ul> <p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>select and use appropriate calculation skills to solve geometrical problems;</li> <li>use geometrical notation and symbols correctly;</li> <li>recognise right angles, perpendicular and parallel lines;</li> <li>know that angles are measured in degrees and that one whole turn is 360 degrees and angles at a point total 360 degrees, then recognise that angles at a point on a straight line total 180 degrees;</li> <li>recognise angles as greater or less than a right angle or half-turn, estimate their size and order them;</li> <li>measure and draw acute, obtuse and right angles to the nearest degree;</li> <li>know that the sum of the angles of a triangle is 180 degrees;</li> <li>make and draw with increasing accuracy 2-D and 3-D shapes and patterns.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>recognise angle as a measurement of turn, and right angles in turns (AT3, level 2);</li> <li>when constructing models and drawing or using shapes, measure and draw angles to the nearest degree and use language associated with angles (AT3, level 5);</li> <li>know the angle sum of a triangle and that of angles at a point (AT3, level 5).</li> </ul>
<p><b>Chapter 24: Transformations and symmetry</b></p> <ul style="list-style-type: none"> <li>transformation, equivalence and congruence in the context of shape;</li> <li>translation, reflection and rotation as types of congruence;</li> </ul>	<p><b>Key Stage 1</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>observe, visualise and describe positions, directions and movements using common words;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>distinguish between straight and turning movements (AT3, level 2);</li> </ul>

<ul style="list-style-type: none"> <li>scaling up and down by a scale factor in the context of shape;</li> <li>similar shapes;</li> <li>reflective and rotational symmetry for two-dimensional shapes.</li> </ul>	<ul style="list-style-type: none"> <li>recognise movements in a straight line (translations) and rotations, and combine them in simple ways;</li> <li>recognise reflective symmetry in familiar 2-D shapes and patterns;</li> <li>recognise simple spatial patterns and relationships and make predictions about them;</li> <li>select and use appropriate equipment and materials when solving shape and space problems.</li> </ul> <p><b>Key Stage 2</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>approach spatial problems flexibly, including trying alternative approaches to overcome difficulties;</li> <li>use checking procedures to confirm that their results of geometrical problems are reasonable;</li> <li>organise work and record or represent it in a variety of ways when presenting solutions to geometrical problems;</li> <li>present and interpret solutions to problems;</li> <li>recognise when shapes are identical;</li> <li>recognise reflective symmetry in regular polygons;</li> <li>visualise and describe movements using appropriate language;</li> <li>transform objects in practical situations;</li> <li>transform images using ICT;</li> <li>visualise and predict the position of a shape following a rotation, reflection or translation;</li> <li>identify and draw 2-D shapes in different orientations on grids.</li> </ul>	<ul style="list-style-type: none"> <li>classify shapes using mathematical properties such as reflective symmetry for 2-D shapes (AT3, level 3);</li> <li>use and make geometric 2-D and 3-D patterns, scale drawings and models in practical contexts (AT3, level 4);</li> <li>reflect simple shapes in a mirror line (AT3, level 4);</li> <li>identify all the symmetries of 2-D shapes (AT3, level 5).</li> </ul>
<p><b>Chapter 25: Classifying shapes</b></p> <ul style="list-style-type: none"> <li>the importance of classification as a process for making sense of the shapes in the world around us;</li> <li>polygons, including the meaning of 'regular polygon';</li> <li>different kinds of triangles;</li> <li>different kinds of quadrilaterals;</li> <li>tessellations;</li> <li>polyhedra, including the meaning of 'regular polyhedron';</li> </ul>	<p><b>Key Stage 1</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>use the correct language and vocabulary for shape and space;</li> <li>describe properties of shapes that they can see or visualise using the related vocabulary;</li> <li>observe, handle and describe common 2-D and 3-D shapes;</li> <li>name and describe the mathematical features of common 2-D and 3-D shapes, including triangles of various kinds, rectangles including squares, circles, cubes, cuboids, then hexagons, pentagons, cylinders, pyramids, cones and spheres;</li> <li>create 2-D shapes and 3-D shapes.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>use mathematical names for common 3-D and 2-D shapes and describe their properties, including numbers of faces, edges and vertices (AT3, level 2);</li> <li>classify 3-D and 2-D shapes in various ways (AT3, level 3).</li> </ul>

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<ul style="list-style-type: none"> <li>• various three-dimensional shapes, including prisms and pyramids;</li> <li>• reflective symmetry applied to three-dimensional shapes.</li> </ul>	<p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• visualise and describe 2-D and 3-D shapes and the way they behave, making more precise use of geometrical language, especially that of triangles, quadrilaterals, and prisms and pyramids of various kinds;</li> <li>• recognise their geometrical features and properties including angles, faces, pairs of parallel lines and symmetry, and use these to classify shapes and solve problems;</li> <li>• visualise 3-D shapes from 2-D drawings.</li> </ul>	
<p><b>Chapter 26: Perimeter, area and volume</b></p> <ul style="list-style-type: none"> <li>• the concepts of area and perimeter;</li> <li>• the ideas of varying the area for a fixed perimeter, and varying the perimeter for a fixed area;</li> <li>• a similar idea with volume and surface area;</li> <li>• ways of investigating areas of parallelograms, triangles and trapeziums;</li> <li>• the units used for measuring area and the relationships between them;</li> <li>• the units used for measuring volume and the relationships between them;</li> <li>• the number <math>\pi</math> and its relationship to the circumference and diameter of a circle.</li> </ul>	<p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• find perimeters of simple shapes;</li> <li>• find areas of rectangles using the formula, understanding its connection to counting squares and how it extends this approach;</li> <li>• calculate the perimeter and area of shapes composed of rectangles.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• use standard metric units of length including finding perimeters (AT3, level 3);</li> <li>• find areas of simple shapes (AT3, level 4);</li> <li>• understand and use the formula for the area of a rectangle (AT3, level 5).</li> </ul>
<p><b>Chapter 27: Handling data</b></p> <ul style="list-style-type: none"> <li>• sorting data according to various criteria and the use of Venn diagrams and Carroll diagrams;</li> <li>• universal set, subset, complement of a set, intersection of sets;</li> <li>• population, variable, and values of a variable in the context of statistical data;</li> <li>• the four stages of handling data: collecting, organizing, representing, interpreting;</li> </ul>	<p><b>Key Stage 1</b>  <b>Breadth of study</b>  <b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>• drawing inferences from data in practical activities;</li> <li>• exploring and using a variety of resources and materials, including ICT.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• use the correct language, symbols and vocabulary associated with data;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• sort objects and classify them using more than one criterion (AT4, level 2);</li> <li>• when they have gathered information to answer a question or explore a situation, record results in simple lists, tables, diagrams and block graphs, in order to communicate their findings (AT4, level 2);</li> </ul>



<ul style="list-style-type: none"> <li>the use of tallying and frequency tables for collecting and organizing data;</li> <li>the idea of sampling when undertaking a survey of a large population;</li> <li>the differences between discrete data, grouped discrete data and continuous data;</li> <li>the representation of discrete data in block graphs;</li> <li>the representation of discrete and grouped discrete data in bar charts;</li> <li>the misleading effect of suppressing zero in a frequency graph;</li> <li>other ways of representing data: pictograms, pie charts, line graphs and scatter diagrams.</li> </ul>	<ul style="list-style-type: none"> <li>solve a relevant problem by using simple lists, tables and charts to sort, classify and organise information, discuss what they have done and explain their results.</li> </ul> <p><b>Key Stage 2</b></p> <p><b>Breadth of study</b></p> <p><b>Pupils should be taught the knowledge, skills and understanding through:</b></p> <ul style="list-style-type: none"> <li>drawing inferences from data in practical activities, and recognising the difference between meaningful and misleading representations of data;</li> <li>exploring and using a variety of resources and materials, including ICT.</li> </ul> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>select and use handling-data skills when solving problems in other areas of the curriculum, in particular science;</li> <li>decide how best to organize and present findings;</li> <li>use the precise mathematical language and vocabulary for handling data;</li> <li>solve problems involving data;</li> <li>interpret tables, lists and charts used in everyday life;</li> <li>construct and interpret frequency tables, including tables for grouped discrete data;</li> <li>represent and interpret discrete data using graphs and diagrams, including pictograms, bar charts and line graphs, then interpret a wider range of graphs and diagrams, using ICT where appropriate;</li> <li>recognize the difference between discrete and continuous data;</li> <li>draw conclusions from statistics and graphs and recognize when information is presented in a misleading way.</li> </ul>	<ul style="list-style-type: none"> <li>extract and interpret information presented in simple tables and lists (AT4, level 3).</li> <li>construct charts and diagrams to communicate information they have gathered for a purpose, and they interpret information presented to them in this form (AT4, level 3);</li> <li>generate and answer questions that require the collection of discrete data which they record using a frequency table (AT4, level 4);</li> <li>using technology where appropriate, group data in equal class intervals if necessary, represent collected data in frequency diagrams and interpret such diagrams (AT4, level 4);</li> <li>construct and interpret simple line graphs (AT4, level 4);</li> <li>interpret graphs and diagrams, including pie charts, and draw conclusions (AT4, level 5).</li> </ul>
<p><b>Chapter 28: Comparing sets of data</b></p> <ul style="list-style-type: none"> <li>how two data sets using the same variable can be presented for comparison;</li> <li>the idea of an average as a representative figure for a set of data;</li> </ul>	<p><b>Key Stage 2</b></p> <p><b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>select and use handling data skills when solving problems in other areas of the curriculum, in particular science;</li> <li>approach problems flexibly, including trying alternative approaches to overcome any difficulties;</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>understand and use an average and range to describe sets of data (AT4, level 4);</li> </ul>

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<ul style="list-style-type: none"> <li>• three measures of average: the mean, the median and the mode;</li> <li>• how to calculate mode, median and mean from a frequency table;</li> <li>• quartiles and the five-number summary of a distribution;</li> <li>• range and inter-quartile range as measures of spread;</li> <li>• box-and-whisker diagrams;</li> <li>• percentiles and deciles;</li> <li>• the concept of average speed.</li> </ul>	<ul style="list-style-type: none"> <li>• identify the data necessary to solve a given problem;</li> <li>• select and use appropriate calculation skills to solve problems involving data;</li> <li>• check results and ensure that solutions are reasonable in the context of the problem;</li> <li>• decide how best to organise and present findings;</li> <li>• use the precise mathematical language and vocabulary for handling data;</li> <li>• know that mode is a measure of average and that range is a measure of spread, and to use both ideas to describe a data set.</li> </ul>	<ul style="list-style-type: none"> <li>• understand and use the mean of discrete data (AT4, level 5);</li> <li>• compare two simple distributions using the range and one of the mode, median or mean (AT4, level 5).</li> </ul>
<p><b>Chapter 29: Probability</b></p> <ul style="list-style-type: none"> <li>• the meaning of probability as a measurement applied to events;</li> <li>• some of the language we use to indicate probability subjectively;</li> <li>• the use of a numerical scale from 0 to 100%, or from 0 to 1, for measuring probability;</li> <li>• estimating probability from statistical data;</li> <li>• estimating probability from data obtained by repeating an experiment a large number of times;</li> <li>• estimating probability by using theoretical arguments based on symmetry and equally likely outcomes;</li> <li>• the use of two-way tables for identifying all the possible equally likely outcomes from an experiment involving two independent events;</li> <li>• mutually exclusive events;</li> <li>• rules for combining probabilities for independent and mutually exclusive events;</li> <li>• a simple model for assessing risk.</li> </ul>	<p><b>Key Stage 2</b>  <b>Pupils should be taught to:</b></p> <ul style="list-style-type: none"> <li>• explore doubt and certainty and develop an understanding of probability through classroom situations;</li> <li>• discuss events using a vocabulary that includes the words ‘equally likely’, ‘fair’, ‘unfair’, ‘certain’.</li> </ul>	<p><b>Pupils:</b></p> <ul style="list-style-type: none"> <li>• understand and use the probability scale from 0 to 1 (AT4, level 5);</li> <li>• find and justify probabilities and approximations to these by selecting and using methods based on equally likely outcomes and experimental evidence, as appropriate (AT4, level 5);</li> <li>• understand that different outcomes may result from repeating an experiment. (AT4, level 5).</li> </ul>