

Requirements for Using Mathematics

Across the curriculum, at a level appropriate to their ability, pupils should be enabled to:

- choose the appropriate materials, equipment and mathematics to use in a particular situation;
- use mathematical knowledge and concepts accurately;
- work systematically and check their work;
- use mathematics to solve problems and make decisions;
- develop methods and strategies, including mental mathematics;
- explore ideas, make and test predictions and think creatively;
- identify and collect information;
- read, interpret, organise and present information in mathematical formats;
- use mathematical understanding and language to ask and answer questions, talk about and discuss ideas and explain ways of working;
- develop financial capability;
- use ICT to solve problems and/or present their work.

Coverage/Range

Number and Algebra

Shape, Space and Measures

Handling Data

Draft Levels of Progression in USING MATHEMATICS across the curriculum: Key Stage 3

The colours used in this document provide a means by which progression in the requirements may be tracked across the levels.

Level 1	Level 2	Level 3
<p>Pupils can:</p> <ul style="list-style-type: none"> • use the materials and equipment required for their work; • talk about ways to solve simple everyday problems; • use simple counting strategies; • look for and talk about simple patterns and make simple predictions; • collect and talk about some identified information; • represent their work using pictures and objects; • use some simple mathematical language; <p>using real objects and in simple activities.</p>	<p>Pupils can:</p> <ul style="list-style-type: none"> • make suggestions about how to approach an activity/problem; • select and use the materials, equipment and mathematical operations required; • use simple counting and mental strategies to carry out calculations and solve problems; • recognise patterns and simple relationships and make simple predictions; • collect and interpret some information; • identify ways of presenting information and recording their findings; • use simple mathematical language to talk about their work; <p>in simple, practical activities in familiar and accessible contexts, using ICT where appropriate.</p>	<p>Pupils can:</p> <ul style="list-style-type: none"> • suggest different ways an activity might be approached; • select and use appropriately the materials, equipment and mathematics required for an activity; • begin to organise their work and check its accuracy; • use mathematics to solve simple, everyday problems; • develop and use efficient mental calculation strategies; • identify and explain patterns and relationships and make predictions; • find, collect and interpret information; • record and present their findings using simple mathematical formats; • use appropriate mathematical language to discuss and describe their work; <p>in structured practical activities in familiar and accessible contexts, using ICT where appropriate.</p>
<p>Pupils can:</p> <ul style="list-style-type: none"> • use, estimate, add and subtract numbers up to at least 10; • understand conservation of number; • create and describe repeating patterns using objects, numbers or pictures; • recognise and use coins. <p>• use everyday language associated with length, 'weight', capacity and area to describe and make simple comparisons;</p> <p>• sequence events, recognise 'special' times on the clock and know the days of the week;</p> <p>• sort 2-D and 3-D shapes and make and describe 2-D and 3-D constructions;</p> <p>• use language and follow instructions, in practical situations, for position and movement.</p> <p>• sort real objects for one criterion and record using objects, drawings or ICT.</p>	<p>Pupils can:</p> <ul style="list-style-type: none"> • read, write and order whole numbers up to at least 100; • understand that the place of the digit indicates its value; • understand and use halves and quarters; • use addition and subtraction patterns up to 10 to understand the relationship between addition and subtraction; • use a symbol to stand for an unknown number; • add and subtract up to at least 20; • recall number facts up to 10; • use simple mental strategies when working with numbers within 20; • understand relationships between all coins up to £1 and use this knowledge to carry out shopping activities. <p>• identify and use non-standard units to measure length, 'weight', capacity and area;</p> <p>• understand the need for standard units and know the most commonly used units in length, 'weight', capacity and time;</p> <p>• name and order days of the week, months of the year, seasons and read simple analogue clock displays;</p> <p>• recognise and name common 2-D shapes and sort 2-D and 3-D shapes, giving reasons for sorting;</p> <p>• recognise turning movements.</p> <p>• sort and classify objects for two criteria;</p> <p>• collect information and record results using simple tables, block graphs and diagrams;</p> <p>• discuss and interpret information.</p>	<p>Pupils can:</p> <ul style="list-style-type: none"> • understand, use, add, subtract and multiply whole numbers up to at least 1000; • understand and use the concept of place value in whole numbers; • approximate to the nearest 10 or 100; • understand and use simple fractions in context; • identify and begin to describe simple number patterns within the 100 square; • solve problems involving division in practical situations; • recall number facts up to 20; • know 2, 3, 4, 5 and 10 multiplication facts and use this knowledge to solve problems; • use number skills to solve problems in the context of money up to £10. <p>• estimate, measure and record length, capacity, volume, 'weight', time and temperature;</p> <p>• find the area of shapes by counting squares;</p> <p>• read simple measuring instruments with an appropriate degree of accuracy;</p> <p>• read and interpret a calendar;</p> <p>• read digital and analogue displays;</p> <p>• recognise, name and describe simple 2-D and 3-D shapes;</p> <p>• recognise lines of symmetry and simple tessellation in 2-D shapes;</p> <p>• recognise right angles in the environment and understand the notion of angle in the context of turning.</p> <p>• collect and record relevant data for a given task;</p> <p>• construct and label simple bar charts and pictograms;</p> <p>• find and interpret information from tables, pictograms, lists, bar charts, simple pie charts and databases.</p>

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Level 4	Level 5
<p>Pupils can:</p> <ul style="list-style-type: none"> • identify the materials, equipment and mathematics required; • plan and organise their own work and work systematically; • review their work and check for accuracy; • use a range of problem-solving strategies; • investigate patterns and relationships, using their findings to make predictions; • find, organise and interpret information; • record and present information clearly, commenting on their findings; • use appropriate mathematical language to discuss their work and explain their thinking; <p>in practical activities with some structure, in familiar and some unfamiliar contexts and situations, using ICT where appropriate.</p>	<p>Pupils can:</p> <ul style="list-style-type: none"> • identify the materials, equipment, mathematics and strategies to be used; • plan and work systematically and efficiently; • independently review their work, considering if their findings are reasonable and making changes where appropriate; • use a range of problem-solving strategies, suggesting and trying out different approaches; • make and test simple predictions, summarise their findings and make general statements; • identify, obtain, process and interpret information; • record and present information accurately and appropriately; • use appropriate mathematical language to express and communicate ideas precisely; <p>in closed or open-ended activities with some structure, in familiar and unfamiliar contexts and situations, using ICT where appropriate.</p>
<p>Pupils can:</p> <ul style="list-style-type: none"> • use knowledge of place value to multiply and divide whole numbers by 10 and 100; • use fractions to describe quantities and proportions, and perform simple calculations involving fractions; • understand equivalence of fractions; • understand and use simple percentages in practical contexts; • interpret and apply simple rules expressed in words; • know multiplication facts up to 10x10 and use this knowledge to solve problems; • add, subtract, multiply and divide whole numbers using a range of mental, written and calculator methods; • add and subtract numbers with up to two decimal places; • use the relationship between addition and subtraction to check simple calculations; • make choices about spending and value for money; • show understanding of ways in which payments for goods can be made. <ul style="list-style-type: none"> • estimate and measure length, 'weight'/mass, time and temperature, working to an appropriate degree of accuracy; • understand the relationship between metric units and choose and use the appropriate metric units for tasks; • add and subtract common measures; • estimate area and volume of simple shapes by counting squares/cubes, using standard units; • find perimeters of simple shapes; • understand and use analogue and digital time, and use am, pm and 24-hour notation; • describe regular and irregular 2-D shapes in terms of sides, angles, symmetry and tessellation; • explore the relationship between 2-D and 3-D shapes; • understand and use the language of line, angle and location; • use co-ordinates in the first quadrant. <ul style="list-style-type: none"> • collect, group, record and present data with given class intervals; • represent and interpret data using a range of graphs, tables and diagrams; • understand and use the language of probability. 	<p>Pupils can:</p> <ul style="list-style-type: none"> • use knowledge of place values to multiply and divide numbers with up to two decimal places by 10, 100; • estimate answers to calculations and approximate by rounding; • understand the relationship between common fractions, decimals and percentages; • calculate simple fractions and percentages of quantities; • use understanding of equivalence to add and subtract fractions; • understand and use negative numbers in practical contexts; • express and use simple formulae and rules for generating sequences in words and/or symbolic form; • multiply and divide numbers with up to 2 decimal places by a whole number; • check calculations by applying inverse operations; • make informed choices about personal budgeting and spending and understand the concept of interest when saving and borrowing. <ul style="list-style-type: none"> • convert from one metric unit to another; • add, subtract, multiply and divide common measures; • calculate areas of squares, rectangles and right-angled triangles and volumes of cubes and cuboids; • understand and use scale in the context of simple maps and drawings; • read and interpret timetables and solve related problems; • reflect 2-D shapes in a line; • describe common 3-D shapes; • draw nets of 3-D shapes; • identify the properties of triangles and quadrilaterals; • measure, draw and label angles. <ul style="list-style-type: none"> • collect, organise, record and represent data; • construct and interpret a range of tables, diagrams and graphs; • design and use a data collection sheet; • calculate and use mean and range; • compare and order the likelihood of events.

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	Level 6	Level 7
	<p>Pupils can:</p> <ul style="list-style-type: none"> • plan for an activity by identifying and sequencing component steps; • consider and identify a range of materials/equipment, mathematical techniques and problem-solving strategies required to meet the purpose of activities; • work systematically and efficiently to a given degree of accuracy; • review their work, using appropriate checking procedures and evaluating their effectiveness at each stage; • adapt their approach as needed; • make and test predictions, make general statements and draw conclusions; • obtain, process and interpret information from a range of sources; • use a range of suitable ways to present findings, following accepted conventions; • use appropriate mathematical language to communicate and explain their work for a wider audience; <p>through discussion, solving routine and non-routine problems with increasing independence in a wide range of familiar and unfamiliar contexts and situations, and using ICT where appropriate.</p>	<p>Pupils can:</p> <ul style="list-style-type: none"> • pose questions to better identify a problem or situation; • plan an activity, explaining their reasons for their chosen structure and approach; • consider and identify, with some justification, the materials/equipment, mathematical techniques and problem-solving strategies required; • use a range of appropriate mathematical techniques and notation • critically review to what extent they succeeded in carrying out activities, checking if the level of accuracy and their findings are appropriate and making an assessment of any limitations. • consider alternative approaches and adapt them as required; • make and test predictions and attempt to justify their generalisations; • consider, identify, obtain and analyse data/information from more than one source; • select and use appropriate methods to present findings, following accepted conventions; • use appropriate mathematical language to explain and justify their findings or solutions; <p>through discussion, solving routine and non-routine problems with increasing independence in a wide range of familiar and unfamiliar contexts and situations, and using ICT where appropriate.</p>
	<p>Pupils can:</p> <ul style="list-style-type: none"> • carry out calculations with numbers of any size in practical contexts; • use equivalences between fractions, decimals and percentages to solve problems; • add, subtract, multiply and divide decimals to a given number of decimal places; • add and subtract fractions, including mixed numbers; • understand, use and calculate ratio and proportion; • calculate using percentages in relevant contexts; • apply mathematical concepts to a range of financial situations; • use conventional notation in algebra; • use formulae; • rearrange simple formulae. • calculate the circumference of circles and the perimeters of composite shapes; • calculate composite areas involving squares, rectangles, triangles; • calculate surface area and composite volumes of cubes and cuboids; • use, convert and calculate measures involving metric and, where appropriate, imperial units; • understand and use compound measures; • work out dimensions using scale; • recognise 2-D representations of 3-D shapes. • collect and record discrete and continuous data using a variety of methods; • construct and interpret a variety of diagrams and graphs for discrete and continuous data; • find and use the median and mode; • use range and one of the measures of average to compare two sets of data; • understand and use the probability scale from 0 to 1 and express likelihood or comparability ; • understand the concept of insurance as a way of mitigating risk. 	<p>Pupils can:</p> <ul style="list-style-type: none"> • use the advanced functions of a calculator to perform complex calculations; • round numbers to an appropriate number of decimal places and significant figures; • express one number as a percentage of another, calculate percentage increase and decrease, and find the original quantity given the result of a percentage change; • use the four operations with fractions; • understand and use inverse proportion; • consider a range of factors to make informed decisions involving money; • manipulate simple algebraic expressions, equations and formulae; • formulate linear equations; • solve two linear equations simultaneously by a graphical method. • use 3 figure bearings to define direction; • enlarge a 2-D shape by a given scale factor; • perform length and area calculations on quadrilaterals and the circle; • understand and apply Pythagoras' Theorem; • solve complex problems involving perimeter, surface area and volume; • understand that measurements have an error margin of half the given unit. • pursue their own lines of enquiry, using appropriate methods of data collection, and interpret and present their findings; • construct and interpret frequency tables and diagrams for sets of continuous data; • estimate the mean of a set of grouped data and choose the most appropriate average (mean, median or mode) for a given line of enquiry; • understand and use relative frequency as an estimate of probability and calculate expected frequency; • apply their knowledge of the rules of probability to calculate an outcome/combination of outcomes.