

## Strand 1: Mathematical processes and applications

Level <b>4</b>	Pupils are developing their own strategies for solving problems and are using these strategies both in working within and applying mathematics to practical contexts. In solving problems with or without a calculator, pupil's check their results are reasonable by considering the context or the size of the numbers. Pupils look for patterns and relationships, presenting information and results in a clear and organised way. They search for a solution by trying out ideas of their own.
Level <b>5</b>	In order to explore mathematical situations, carry through tasks or tackle problems, pupils identify the mathematical aspects and obtain necessary information. They calculate accurately, using ICT when appropriate. Pupils check their working and results, considering whether these are sensible. They show understanding of situations by describing them mathematically using symbols, words and diagrams. They draw simple conclusions of their own and give an explanation of their reasoning.
Level <b>6</b>	Pupils carry though substantial tasks and solve quite complex problems by independently and systematically breaking them down into smaller, more manageable tasks. They interpret, discuss and synthesise information presented in a variety of mathematical forms, relating findings to the original context. Pupils written and spoken language explains and informs their use of diagrams. Pupils are beginning to give mathematical justifications, making connections between the current situation and the ones they have met before.
Level <b>7</b>	Starting from problems or contexts that have been presented to them, pupils explore the effects of varying values and look for invariance in models and representations working with and without ICT. They progressively refine or extend the mathematics used, giving a reason for their choice of mathematical presentation and explaining features they have selected. Pupils justify their generalisations, arguments or solutions, looking for equivalence to different problems with similar structures. They appreciate the difference between mathematical explanation and experimental evidence.
Level <b>8</b>	Pupils develop and follow alternative approaches. They compare and evaluate representations of a situation, introducing and using a range of mathematical techniques. They reflect on their own lines of enquiry when exploring mathematical tasks. Pupils communicate mathematical or statistical meaning to different audiences through precise and consistent use of symbols that is sustained throughout the work. They examine generalisations or solutions reached in an activity, commenting constructively on the reasoning and logic or the process employed, or the results obtained, and make further progress in the activity as a result.
<b>EP</b>	Pupils critically examine the strategies adopted when investigating within mathematics itself or when using mathematics to analyse tasks. They explain why different strategies were used, considering the elegance and efficiency of alternative lines of enquiry or procedures. Pupils apply the mathematics they know in a wide range of familiar and unfamiliar contexts. They use the mathematical language and symbols effectively in presenting a convincing reasoned argument. Their reports include mathematical justifications, distinguishing between evidence and proof and explaining their solutions to problems involving a number of features or variables.

## Strand 2: Number and algebra

Level <b>4</b>	Pupils use their understanding of place value to multiply and divide whole numbers by 10 or 100. In solving number problems, pupils use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to $10 \times 10$ and quick derivation of corresponding division facts. They use efficient written methods of addition and subtraction and of short multiplication and division. They recognise approximate proportions of a whole and use simple fractions and percentages to describe these. They begin to use simple formulae expressed in words.
Level <b>5</b>	Pupils use their understanding of place value to multiply and divide whole numbers and decimals. They order, add and subtract negative numbers in context. They use all four operations with decimals to two decimal places. They solve simple problems involving ratio and direct proportion. They calculate fractional or percentage parts of quantities and measurements, using a calculator where appropriate. They construct, express in symbolic form, and use simple formulae involving one or two operations. They use brackets appropriately. Pupils use and interpret coordinates in all four quadrants.
Level <b>6</b>	Pupils order and approximate decimals when solving numerical problems and equations, using trial-and-improvement methods. Pupils evaluate one number as a fraction or percentage of another. They understand and use the equivalences between fractions, decimals and percentages, and calculate using ratios in appropriate situations. They add and subtract fractions by writing them with a common denominator. Pupils find and describe in words the rule for the next term or $n$ th term of a sequence where the rule is linear. They formulate and solve linear equations with whole-numbers coefficients. They represent mapping expressed algebraically, and use Cartesian coordinates for graphical representation interpreting general features.
Level <b>7</b>	In making estimates, pupils round to one significant figure and multiply and divide mentally. They understand the effects of multiplying and dividing by numbers between 0 and 1. Pupils solve numerical problems involving multiplication and division with numbers of any size, using a calculator efficiently and appropriately. They understand and use proportional changes, calculating the result of any proportional change using only multiplicative methods. Pupils find and describe in symbols the next term or $n$ th term of a sequence where the rule is quadratic. Pupils use algebraic and graphical methods to solve simultaneous linear equations in two variables.
Level <b>8</b>	Pupils solve problems involving calculating with powers, roots and numbers expressed in standard form. They choose to use fractions or percentages to solve problems involving repeated proportional changes or the calculation of original quantity given the result of a proportional change. They evaluate algebraic formulae or calculate one variable, given the others, substituting fractions, decimals and negative numbers. Pupils manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions. They solve inequalities in two variables. Pupils sketch and interpret graphs of linear, quadratic, cubic and reciprocal functions, and graphs that model real situations.
<b>EP</b>	Pupils understand and use rational and irrational numbers. They determine the bounds of intervals. Pupils understand and use direct and inverse proportion. In simplifying algebraic expressions, they use the rules of indices for negative and fractional values. In finding formulae that approximately connect data, pupils express general laws in symbolic form. They solve simultaneous equations in two variables where one equation is linear and the other is quadratic. They solve problems using intersections and gradients.

## Strand 3: Geometry and measures

Level <b>4</b>	Pupils make 3-D mathematical models by linking given faces or edges, draw common 2-D shapes in different orientations on grids. They reflect simple shapes in a mirror line. They choose and use appropriate units and tools, interpreting, with appropriate accuracy, numbers on a range of measuring instruments. They find perimeters of simple shapes and find areas by counting squares.
Level <b>5</b>	When constructing models and when drawing or using shapes, pupils measure and draw angles to the nearest degree, and use language associated with angle. Pupils know the angle sum of a triangle and that of angles at a point. They identify all the symmetries of 2-D shapes. They convert one metric unit to another. They make sensible estimates of a range of measures in relation to everyday situations. Pupils understand and use the formula for the area of a rectangle.
Level <b>6</b>	Pupils recognise and use common 2-D representations of 3-D objects. They know and use the properties of quadrilaterals. They solve problems using angle and symmetry properties of polygons and angle properties of intersecting and parallel lines, and explain these properties. They devise instructions for a computer to generate and transform shapes and paths. They understand and use appropriate formulae for finding circumferences and areas of circles, areas of plane rectilinear figures and volumes of cuboids when solving problems.
Level <b>7</b>	Pupils understand and apply Pythagoras' theorem when solving problems in two dimensions. They calculate lengths, areas and volumes in plane shapes and right prisms. Pupils enlarge shapes by a fractional scale factor, and appreciate the similarity of the resulting shapes. They determine the locus of an object moving according to a rule. Pupils appreciate the imprecision of measurement and recognise that a measurement given to the nearest whole number may be inaccurate by up to one half in either direction. They understand and use compound measures, such as speed.
Level <b>8</b>	Pupils understand and use congruence and mathematical similarity. They use sine, cosine and tangent in right angled triangles when solving problems in two dimensions.
<b>EP</b>	Pupils sketch graphs of sine, cosine and tangent functions for any angle, and generate and interpret graphs based on these functions. Pupils use sine, cosine and tangent angles of any size, and Pythagoras' theorem when solving problems in two and three dimensions. They use the conditions for congruent triangles in formal geometric proofs (for example, to prove that the base angles of an isosceles triangle are equal). They calculate lengths of circular arcs and areas of sectors, and calculate the surface area of cylinders and volumes of cones and spheres. Pupils appreciate the continuous nature of scales that are used to make measurements.

## Strand 4: Statistics

Level <b>4</b>	Pupils collect discrete data and record them using a frequency table. They understand and use the mode and range to describe sets of data. They group data, where appropriate, in equal class intervals, represent collected data in frequency diagrams and interpret such diagrams. They construct and interpret simple line graphs.
Level <b>5</b>	Pupils understand and use the mean of discrete data. They compare two simple distributions, using the range and one of the mode, median or mean. They interpret graphs and diagrams, including pie charts, and draw conclusions. They understand and use the probability scale from 0 to 1. Pupils find and justify probabilities and approximations to these, by selecting and using methods based on equally likely outcomes and experimental evidence, as appropriate. They understand that different out comes may result from repeating an experiment.
Level <b>6</b>	Pupils collect and record continuous data, choosing appropriate equal class intervals over a sensible range to create frequency tables. They construct and interpret frequency diagrams. They construct pie charts. Pupils draw conclusions from scatter diagrams, and have basic understanding of correlation. When dealing with a combination of two experiments, pupils identify all the outcomes. In solving problems, they use their knowledge that the total probability of all the mutually exclusive out comes of an experiment is 1.
Level <b>7</b>	Pupils specify hypotheses and test them by designing and using appropriate methods that take account of variability or bias. They determine the modal class and estimate the mean, median and range of sets of grouped data, selecting the statistic most appropriate to their line of enquiry. They use measures of average and range, with associated frequency polygons, as appropriate, to compare distributions and make inferences. Pupils understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.
Level <b>8</b>	Pupils interpret and construct cumulative frequency tables and diagrams, They estimate the median and interquartile range and make inferences. They understand how to calculate the probability of a compound event and use this in solving problems.
<b>EP</b>	Pupils interpret and construct histograms. They understand how different methods of sampling and different sample sizes may affect the reliability of conclusions drawn. They select and justify a sample and method to investigate a population. They recognise when and how to work with probabilities associated with independent mutually exclusive events.