

Maths - Key Stage 3 Level Descriptors

	Assessment Foci 1 – Using and applying	AF2 - Algebra	AF3 - Calculating	AF4 – Numbers and the number system	AF5 – Shape and space	AF6 - Statistics
Level 8	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. They 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 and make further progress in the activity as a result. They comment constructively on the reasoning and logic, the process employed and the results obtained.	factorise quadratic expressions including the difference of two squares, e.g. $x^2 - 9 = (x + 3)(x - 3)$ manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions, derive and use more complex formulae and change the subject of a formula, evaluate algebraic formulae, substituting fractions, decimals and negative numbers, solve inequalities in two variables and find the solution set, sketch, interpret and identify graphs of linear, quadratic, cubic and reciprocal functions, and graphs that model real situations, understand the effect on a graph of addition of (or multiplication by) a constant	use fractions or percentages to solve problems involving repeated proportional changes or the calculation of the original quantity given the result of a proportional change, solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude and using a calculator as appropriate	understand the equivalence between recurring decimals and fractions	understand and use congruence and mathematical similarity. They use sine, cosine and tangent in right-angled triangles when solving problems in two dimensions.	Pupils interpret and construct cumulative frequency tables and diagrams. They estimate the median and interquartile range and use these to compare distributions and make inferences. They understand how to calculate the probability of a compound event and use this in solving problems.
Level 7	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 reasons for their choice of mathematical presentation and explaining features they have selected. They 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.	square a linear expression, and expand and simplify the product of two linear expressions of the form $(x + n)$ and simplify the corresponding quadratic expression, use algebraic and graphical methods to solve simultaneous linear equations in two variables, solve inequalities in one variable and represent the solution set on a number line, use formulae from mathematics and other subjects; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject, find the next term and nth term of quadratic sequences and functions and explore their properties, plot graphs of simple quadratic and cubic functions, e.g. $y = x^2$, $y = 3x^2 + 4$, $y = x^3$	calculate the result of any proportional change using multiplicative methods, understand the effects of multiplying and dividing by numbers between 0 and 1, add, subtract, multiply and divide fractions, make and justify estimates and approximations of calculations; estimate calculations by rounding numbers to one significant figure and multiplying and dividing mentally, use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation	understand and use proportionality	Pupils understand and apply Pythagoras' theorem when solving problems in two dimensions. They calculate lengths, areas and volumes in plane shapes and right prisms. They 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. They 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.	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. They understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.
Level 6	Pupils carry out 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. Their written and spoken language explains and informs their use of diagrams. They begin to give mathematical justifications, making connections between the current situation and situations they have encountered before.	use systematic trial and improvement methods and ICT tools to find approximate solutions to equations such as $x^3 + x = 20$, construct and solve linear equations with integer coefficients, using an appropriate method, generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, on paper and using ICT; write an expression to describe the nth term of an arithmetic sequence. Plot the graphs of linear functions, where y is given explicitly in terms of x ; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs, construct functions arising from real-life problems and plot their corresponding graphs; interpret graphs arising from real situations	calculate percentages and find the outcome of a given percentage increase or decrease, divide a quantity into two or more parts in a given ratio and solve problems involving ratio and direct proportion, use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole, add and subtract fractions by writing them with a common denominator, calculate fractions of quantities (fraction answers), multiply and divide an integer by a fraction	use the equivalence of fractions, decimals and percentages to compare proportions	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.	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. They draw conclusions from scatter diagrams, and have a basic understanding of correlation. When dealing with a combination of two experiments, they identify all the outcomes. When solving problems, they use their knowledge that the total probability of all the mutually exclusive outcomes of an experiment is 1.

Level 5	In order to explore mathematical situations, carry out tasks or tackle problems, pupils identify the mathematical aspects and obtain necessary information. They calculate accurately, using ICT where appropriate. They 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 explain their reasoning.	construct, express in symbolic form, and use simple formulae involving one or two operations, use and interpret coordinates in all four quadrants	use known facts, place value, knowledge of operations and brackets to calculate including using all four operations with decimals to two places, use a calculator where appropriate to calculate fractions/percentages of quantities/measurements, understand and use an appropriate non-calculator method for solving problems that involve multiplying and dividing any three digit number by any two-digit number, solve simple problems involving ordering, adding, subtracting negative numbers in context, solve simple problems involving ratio and direct proportion, apply inverse operations and approximate to check answers to problems are of the correct magnitude	use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000 and explain the effect of rounding decimals to the nearest decimal place and order negative numbers in context, recognise and use number patterns and relationships, use equivalence between fractions and order fractions and decimals, reduce a fraction to its simplest form by cancelling common factors, understand simple ratio	When constructing models and drawing or using shapes, pupils measure and draw angles to the nearest degree and use language associated with angles. They 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. They understand and use the formula for the area of a rectangle.	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. They 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 outcomes may result from repeating an experiment.
Level 4	Pupils develop their own strategies for solving problems and use these strategies both in working within mathematics and in applying mathematics to practical contexts. When solving problems, with or without ICT, they check their results are reasonable by considering the context. They look for patterns and relationships, presenting information and results in a clear and organised way, using ICT appropriately. They search for a solution by trying out ideas of their own.	begin to use simple formulae expressed in words, use and interpret coordinates in the first quadrant	use a range of mental methods of computation with all operations, recall multiplication facts up to 10×10 and quickly derive corresponding division facts, use efficient written methods of addition and subtraction and of short multiplication and division, multiply a simple decimal by a single digit, solve problems with or without a calculator, check the reasonableness of results with reference to the context or size of numbers	recognise and describe number patterns, recognise and describe number relationships including multiple, factor and square, use place value to multiply and divide whole numbers by 10 or 100, recognise approximate proportions of a whole and use simple fractions and percentages to describe these, order decimals to three decimal places, begin to understand simple ratio	Pupils use and make geometric 2-D and 3-D patterns, scale drawings and models in practical contexts. 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 areas of simple shapes.	Pupils generate and answer questions that require the collection of discrete data which they record using a frequency table. They understand and use an average and range to describe sets of data. Using technology where appropriate: they group data in equal class intervals if necessary, represent collected data in frequency diagrams and interpret such diagrams. They construct and interpret simple line graphs.
Level 3	Pupils try different approaches and find ways of overcoming difficulties that arise when they are solving problems. They are beginning to organise their work and check results. Pupils discuss their mathematical work and are beginning to explain their thinking. They use and interpret mathematical symbols and diagrams. Pupils show that they understand a general statement by finding particular examples that match it.	recognise a wider range of sequences, begin to understand the role of '=' (the 'equals' sign)	derive associated division facts from known multiplication facts, add and subtract two-digit numbers mentally, add and subtract three digit numbers using written method, multiply and divide two digit numbers by 2, 3, 4 or 5 as well as 10 with whole number answers and remainders, use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers, solve whole number problems including those involving multiplication or division that may give rise to remainders	understand place value in numbers to 1000, use place value to make approximations, recognise negative numbers in contexts such as temperature, use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent, begin to use decimal notation in contexts such as money	Pupils classify 3-D and 2-D shapes in various ways using mathematical properties such as reflective symmetry for 2-D shapes. They use non-standard units, standard metric units of length including finding perimeters, capacity and mass, and standard units of time, in a range of contexts.	Pupils extract and interpret information presented in simple tables and lists. They construct charts and diagrams to communicate information they have gathered for a purpose, and they interpret information presented to them in this form.

Maths - Key Stage 4 Grade Descriptors

	Assessment Foci 1 - Number	AF2 - Algebra	AF3 – Shape, Space, Measures	AF4 – Data handling	AF5 – Using and applying maths
Grade A*	Bounds in area/volume questions Complex indices, including surds	Solve equations, one linear and one quadratic Equation of circle and intersection points with line Trig functions Exponential/complex functions Algebraic fractions Rearrange complex equations Graphical functions, $y = f(x+a)$; $y = f(ax)$	Trig in 3-D using sine and cosine rules Sine/cosine rule Mensuration in 3D solids and 2D shapes Proof of circle theorems Proof of construction theorems		Students make and test hypotheses and conjectures. They adopt appropriate strategies to tackle problems (including those that are novel or unfamiliar), adjusting their approach when necessary. They tackle problems that bring together different aspects of mathematics and may involve multiple variables. They can identify some variables and investigate them systematically, the outcomes of which are used in solving the problem. Students can communicate their chosen strategy. They can construct a rigorous argument, making inferences and drawing conclusions. They produce simple proofs and can identify errors in reasoning.
Grade A	Rationalising surds Upper/lower bounds Fractional indices	Rearrange equations/formulae, variable twice $\frac{1}{x} + \frac{1}{2x} - \frac{1}{6x}$ Simple algebraic fractions, Algebraic problems, explain why $(n+1)(n+20)$ is an even number Solve quadratics by, factorizing, formula or completing the square Solve equations graphically Difference of two squares Simplify algebra involving powers Equation of line through point and perpendicular to a given line	Trig solutions, $\cos x = 0.5$ Trig graphs Sine and cosine rule Surface area/volume of various solids Arcs/sectors/segments Trig/Pythagoras in 3-D Similarity between length/area/volume Calculate distance between points using 3-D co-ordinates Prove that triangles are congruent Circle theorems Enlargement, negative fractional scale factor Area of triangle = $\frac{1}{2}ab\sin C$	Histograms Types of Sampling, stratified sampling Combined events, using multiplication	
Grade B	Compound Interest Reverse % Calculating with Fractions (Evaluate formulae) Standard form Negative and Zero Indices	Difference of 2 squares Solve inequalities by algebra/graphical methods Solve simultaneous equations by graphical/algebra methods Match equations to graphs Solve quadratic equations by factorizing, $a = 1$ Solve equations, involving fractions Expand brackets and simplify by collecting like terms Use $y=mx+c$ to find the gradient and intercept without drawing Solve cubic equations graphically (graph given) Solve quadratic equations graphically. Table of values and graphs for cubic and reciprocal functions Cancelling down where denominator is an algebraic expression Factorising various expressions, $6(a-b)^2 - 3(a-b)$	Use of circle theorems Similar shapes Trig – multistage Describing transformations Interior/Exterior angles of polygons + tessellations involving polygons Dimensions of formulae	Tree diagrams Probability: Use of 1-n Analysing data to compare with theoretical results Draw box and whisker plots from cumulative frequency table/curve Median/IQR from cumulative frequency table/curve	
Grade C	Estimation, division by number less than 1 Compound interest, no rounding necessary Calculator use, complex Multiplication/division by number between 0 and 1 Fractions (Multiplication/Division) Ratios % decrease/increase Multiplication/division by powers of 10 and decimals Prime factors as indices (Factor Trees) Rules of indices, numeric but not '0'	Solve equations by trial and improvement(cubic & quadratics) Simple rearrangement Solve equations Solve inequalities Expand brackets and simplify Quadratic tables and graphs Real life graphs, water filling, travel graphs nth term linear Find length of a line given 2 points Substitution into complex formulae	Construct perpendicular bisector of a given line Loci Volumes Circles, area & circumference given diameter Transformations - Translation using vectors Trig/Pythagoras Formal constructions (Triangles with 60, 45 & 90 degrees) Polygons Bearings	Draw box and whisker plot Moving averages Mean/median from grouped data Designing questionnaires Explain the use of mean, median, mode, etc	
Grade D	Estimation Profit/loss Simple proportion Increase/decrease by given % & fraction Fraction (Convert to decimals & % s) Ratios in recipes questions	Expand $x(x+4)$ Factorise $x^2 - 5x, 12x - 8$ Unstructured linear graphs Derive equations from diagrams and solve Substituting negative numbers into algebraic expressions Expand and simplify brackets and expressions Solve equations, variable on each side, brackets involved	Area unit convert, m^2 to cm^2 Area/circumference of circles given radius Area of triangle/regular polygons/compound shapes Draw and measure bearings Midpoint of line given end co-ordinates Simple transformations Polygons Similar triangles, positive scale factor Plan and elevation Parallel lines and shapes linked with the same Triangle proofs, exterior angle property	Construct a stem and leaf diagram Relative probability Find missing probability from list/table of results Scatter graph and types of correlation Draw and use lines of best fit Mode from grouped frequencies Mean from a discrete frequency distribution Explain deficiencies in questionnaires/sampling techniques/practical techniques	

Grade E	<p>Simplifying ratios Use of calculator, $1-5^3$; square root of 23-78 Rounding to 1 s.f. Fractions of quantities Long multiplication/division, involving decimals % without calculator Ordering fractions/decimals/percentages Indices/powers/roots, 4^3, $2^3 \times 3^2$, the cube of 4 Four rules of negative numbers Calculate VAT</p>	<p>Linear table and graph Simplify simple algebraic expressions – collect like terms Use a formula inversely, find x if $y=3$ in the formula $y = 2x-1$ Conversion graphs Complex number sequences Solve equations $3y + 2 = 8$</p>	<p>Geometry of triangle/quadrilateral Measure simple bearings Enlargements Metric/Imperial conversions using known facts Simple volume calculations Complete tessellations Area/Perimeter of rectangles/kites Planes of symmetry Nets of shapes Accurate drawings/angles from given information Simple transformations</p>	<p>Interpret a stem and leaf diagram to find the median Interpret a time series graph Data collection sheets Find probabilities from 2 way table Probability of not = $1-n$ Use fx in a frequency table Construct a pie chart</p>	<p>Students can work mathematically in everyday and meaningful contexts. They make use of diagrams and symbols to communicate mathematical ideas. Sometimes they check the accuracy and reasonableness of their results. Students can test simple hypotheses and conjectures based on evidence. They are able to use data to look for patterns and relationships. They state a generalisation arising from a set of results and identify counterexamples. They solve simple problems, some of which are non-routine.</p>
Grade F	<p>Long multiplication/division, 3 digit by 2 digit Simple %/fraction of quantity (numerator more than one) Bidmas Rounding to d.p. Place value Simple squares/cubes/roots Number factors Convert %/fractions/decimals Negative numbers in context</p>	<p>Finding terms in a linear sequence Non-linear number sequences Co-ordinates in 4 quadrants Use simple formulae Solve equations $5x = 25$, $x-2=6$ Derive simple expressions</p>	<p>Estimate lengths Co-ordinates in all 4 quadrants Simple scale drawings Name/measure and draw angles Name polygons Lines of symmetry Rotational symmetry Angles on a straight line = 180 Faces/edges/vertices</p>	<p>State simple probability List all outcomes (sample space diagram) Estimate probability from diagram/pie chart/table Find range, also comparing two distributions Find mean/mode Use pie chart Use Bar charts to compare 2 sets of data</p>	
Grade G	<p>Rounding to the nearest integer Bills/timetables Rounding to the nearest 10,100,etc Fraction/% shaded, from a diagram Simple number patterns Simple fractions of quantities, numerator of 1 Ordering decimals Order/read/write whole numbers Convert to a ratio, 1/3 of a whole is 1:2</p>	<p>Co-ordinates in the 1st quadrant Reading from real life graphs Next term in a simple linear sequence</p>	<p>Area/Perimeter/volume by counting Draw 2D shapes Measure/draw a line/circle Name shapes Draw line of symmetry Use given line of reflection Accurate drawings of given shapes</p>	<p>Find median/mode using single digits Draw and interpret line graphs/bar charts/pictograms Make tables/lists/tally charts, discrete data Able to choose the ‘most likely’ from information given</p>	

Maths - Key Stage 5 Grade Descriptors

	Assessment Foci 1 -
Grade A*	
Grade A	<p>Students recall or recognise almost all the mathematical facts, concepts and techniques that are needed, and select appropriate ones to use in a wide variety of contexts.</p> <p>Students manipulate mathematical expressions and use graphs, sketches and diagrams, all with high accuracy and skill. They use mathematical language correctly and proceed logically and rigorously through extended arguments or proofs. When confronted with unstructured problems they can often devise and implement an effective solution strategy. If errors are made in their calculations or logic, these are sometimes noticed and corrected.</p> <p>Students recall or recognise almost all the standard models that are needed, and select appropriate ones to represent a wide variety of situations in the real world.</p> <p>They correctly refer results from calculations using the model to the original situation; they give sensible interpretations of their results in the context of the original realistic situation. They make intelligent comments on the modelling assumptions and possible refinements to the model.</p> <p>Students comprehend or understand the meaning of almost all translations into mathematics of common realistic contexts. They correctly refer the results of calculations back to the given context and usually make sensible comments or predictions. They can distil the essential mathematical information from extended pieces of prose having mathematical content. They can comment meaningfully on the mathematical information.</p> <p>Students make appropriate and efficient use of contemporary calculator technology and other permitted resources, and are aware of any limitations to their use. They present results to an appropriate degree of accuracy.</p>
Grade B	<p>Candidates recall or recognise most of the mathematical facts, concepts and techniques that are needed, and usually select appropriate ones to use in a wide variety of contexts.</p> <p>Candidates manipulate mathematical expressions and use graphs, sketches and diagrams, all with good accuracy and skill. They often use mathematical language correctly and proceed logically and rigorously through extended arguments or proofs. When confronted with unstructured problems they can often devise and implement an effective solution strategy. If errors are made in their calculations or logic, these are sometimes noticed and corrected.</p> <p>Candidates recall or recognise most of the standard models that are needed, and usually select appropriate ones to represent a wide variety of situations in the real world. They correctly refer results from calculations using the model to the original situation; they give sensible interpretations of their results in the context of the original realistic situation. They make intelligent comments on the modelling assumptions and possible refinements to the model.</p> <p>Candidates often comprehend or understand the meaning of most translations into mathematics of common realistic contexts. They usually refer the results of calculations back to the given context and usually make sensible comments or predictions. They often can distil the essential mathematical information from extended pieces of prose having mathematical content. They can comment meaningfully on the mathematical information.</p> <p>Candidates make appropriate and efficient use of contemporary calculator technology and other permitted resources, and are aware of any limitations to their use. They present results to an appropriate degree of accuracy.</p>
Grade C	<p>Students recall or recognise most of the mathematical facts, concepts and techniques that are needed, and usually select appropriate ones to use in a variety of contexts.</p> <p>Students manipulate mathematical expressions and use graphs, sketches and diagrams, all with a reasonable level of accuracy and skill. They use mathematical language with some skill and sometimes proceed logically through extended arguments or proofs. When confronted with unstructured problems they sometimes devise and implement an effective and efficient solution strategy. They occasionally notice and correct errors in their calculations.</p> <p>Students recall or recognise most of the standard models that are needed and usually select appropriate ones to represent a variety of situations in the real world.</p> <p>They often correctly refer results from calculations using the model to the original situation, they sometimes give sensible interpretations of their results in the context of the original realistic situation. They sometimes make intelligent comments on the modelling assumptions and possible refinements to the model.</p> <p>Students comprehend or understand the meaning of most translations into mathematics of common realistic contexts. They often correctly refer the results of calculations back to the given context and sometimes make sensible comments or predictions. They distil much of the essential mathematical information from extended pieces of prose having mathematical content. They give some useful comments on this mathematical information.</p> <p>Students usually make appropriate and efficient use of contemporary calculator technology and other permitted resources, and are sometimes aware of any limitations to their use. They usually present results to an appropriate degree of accuracy.</p>
Grade D	<p>Candidates usually recall and recognise most of the mathematical facts, concepts and techniques that are needed, and usually select appropriate ones to use in some contexts.</p> <p>Candidates manipulate most mathematical expressions and use graphs, sketches and diagrams, all with moderate accuracy and skill. They quite often use mathematical language correctly and occasionally can proceed logically through extended arguments or proofs.</p> <p>Candidates recall or recognise most of the standard models that are needed, and quite often select appropriate ones to represent a variety of situations in the real world. They quite often correctly refer results from calculations using the model to the original situation; they try to interpret their results in the context of the original realistic situation with some success.</p> <p>Candidates quite often comprehend or understand the meaning of translations into mathematics of common realistic contexts. They quite often correctly refer the results of calculations back to the given context and often attempt to give comments or predictions. They distil most but not all of the essential mathematical information from extended pieces of prose having mathematical content. They can attempt to comment on this mathematical information.</p> <p>Candidates quite often make appropriate and efficient use of contemporary calculator technology and other permitted resources. They quite often present results to an appropriate degree of accuracy.</p>
Grade E	<p>Students recall or recognise some of the mathematical facts, concepts and techniques that are needed, and sometimes select appropriate ones to use in some contexts.</p> <p>Students manipulate mathematical expressions and use graphs, sketches and diagrams, all with some accuracy and skill. They sometimes use mathematical language correctly and occasionally proceed logically through extended arguments or proofs.</p> <p>Students recall or recognise some of the standard models that are needed and sometimes select appropriate ones to represent a variety of situations in the real world. They sometimes correctly refer results from calculations using the model to the original situation; they try to interpret their results in the context of the original realistic situation.</p> <p>Students sometimes comprehend or understand the meaning of translations in mathematics of common realistic contexts. They sometimes correctly refer the results of calculations back to the given context and attempt to give comments or predictions. They distil some of the essential mathematical information from extended pieces of prose having mathematical content. They attempt to comment on this mathematical information.</p> <p>Students often make appropriate and efficient use of contemporary calculator technology and other permitted resources. They often present results to an appropriate degree of accuracy.</p>