

Grade Descriptors for Maths

Years 7 -11

Grade 8	
Number	Solve and calculate the value of complex indices including surds Rationalise more complex denominators e.g. $\frac{1}{2+\sqrt{3}}$ Understand and use rational and irrational numbers
Algebra	Calculate the n th term of a quadratic sequence Solve simultaneous equations with one linear and one quadratic function Use the equation of a circle to find points of intersection with a line Calculate the equation of a circle given the centre and a point on the circumference Estimate area under a quadratic or other graph by dividing it into trapezia Calculate the acceleration and distance from velocity-time graphs Simplify and solve algebraic fractions Calculate the inverse function and construct and use composite functions e.g.: $f(x)=5x$ and $g(x)=x^2$. Write down the value of $f(5)$ Write down the inverse of $g(x)$ Write down the composite function of $fg(x)$
Ratio & Proportion	Set up, solve and interpret the answers in growth and decay problems
Geometry	Transform both trigonometric and other functions. e.g.: Show $y = -f(x)$, $y = f(-x)$, $y=f(x+a)$, $y=f(x)+a$ Sketch quadratic functions; identifying y and x -axis intercepts and turning points Use the sine and cosine rule in 3 dimensions Prove all circle theorems algebraically Use and apply vectors to prove lines are collinear or parallel
Probability	Use a Venn diagram to calculate conditional probability

Grade 7	
Number	Solve complex problems involving index laws Evaluate numbers with positive, fractional and negative indices Rationalise simple fractions with a surd as the denominator e.g.: $\frac{3}{\sqrt{3}}$ Write the denominator in terms of its prime factors, determine whether a fraction can be expressed as a recurring or terminating decimal. Calculate limits using upper and lower bounds
Algebra	Rearrange formulae with same variable on both sides Solve Quadratics using the formula, factorising and including completing the square Recognise the difference of two squares Algebraic proof – to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs.

	<p>e.g.: explain why $(n+1)(n+20)$ is an even number</p> <p>Plot and find the equation of a circle</p> <p>Calculate the equation of a line given two points and the equations of a perpendicular line</p> <p>Solve inequalities algebraically and graphically</p>
Ratio & Proportion	<p>Solve problems involving inverse and direct proportion including squares, square roots</p> <p>Plot and interpret exponential functions $(y=k^x)$ for positive values of k</p> <p>Use similarity in length, area and volume to calculate scale factors and vice versa</p>
Geometry	<p>Identify trigonometric graphs</p> <p>Use and apply Pythagoras in 3D situations</p> <p>e.g.: diagonal lengths in cuboid and lengths of lines given 3D coordinates</p> <p>Calculate the area of any given triangle using $\frac{1}{2}ab\sin C$</p> <p>Use and apply both sine and cosine rule to triangles and apply to bearing questions</p> <p>Enlarge a shape given a negative fractional scale factor</p> <p>Use and apply all circle theorems</p> <p>Use graphs to solve problems involving distance, speed and acceleration</p>
Statistics	<p>Construct and interpret histograms</p> <p>Use moving averages to identify seasonality and trends in time series data and use them to make predictions</p> <p>Understand the structure of a stratified sample and calculate the proportion</p>
Probability	<p>Use a tree diagram to calculate conditional probability</p>

Grade 6

Number	<p>Recall index laws such as n^0 and involving fractional powers ($9^{1/2}$ and $8^{1/3}$)</p> <p>Understand the definition of a surd and perform calculations involving roots e.g.: $\sqrt{16} \times \sqrt{4} = 8$</p> <p>Simplify surds e.g.: $\sqrt{12} = 2\sqrt{3}$</p> <p>Convert a fraction to a recurring decimal and vice versa</p> <p>Solve problems involving standard form</p>
Algebra	<p>Use iterative processes to generate sequences</p> <p>Use iterative methods to calculate solutions.</p> <p>Multiply three binomials e.g.: $(x+5)(x+3)(x-6)$</p> <p>Identify linear, quadratic, cubic, reciprocal and exponential graphs</p> <p>Solve quadratics graphically and by factorising</p> <p>Solve and simplify algebraic fractions</p> <p>Construct and solve simultaneous linear equations</p> <p>Calculate the equation of a linear function given two coordinates</p>
Ratio & Proportion	<p>Calculate reverse and compound percentage</p> <p>Construct and solve equations involving direct and inverse proportion.</p> <p>Use kinematics formulae to calculate speed and acceleration from worded and graphical situations</p>
Geometry	<p>Enlarge a shape given a negative integer scale factor</p> <p>Describe fully a single transformation</p> <p>Describe the changes and invariance achieved by transformations</p> <p>Calculate and solve vector problems involving ratio</p> <p>Calculate the number of sides on a regular polygon given the interior and exterior angles.</p> <p>Understand and use the formulae: $(n-2) \times 180 = \text{Sum of Degrees in a Polygon}$ and $360/n = \text{exterior angle}$</p> <p>Recall and use the formulae for volume and surface area for pyramids, frustums and cones.</p> <p>Calculate the dimensions given the volume or surface area</p>

Statistics	<ul style="list-style-type: none"> Plot and interpret cumulative frequency graphs Plot and interpret boxplots Plot a time-series graph Construct and interpret tables and calculate averages from continuous data
Probability	<ul style="list-style-type: none"> Calculate the outcomes of two or more events by using the product rule Calculate a missing probability from a list or two-way table, including algebraic terms Use a two-way table to calculate conditional probability Compare relative frequency and theoretical probabilities including from different sample sizes

Grade 5

Number	<ul style="list-style-type: none"> Use index notation, including the use of negative integer powers Estimate the answer to square roots & cube roots e.g.: $\sqrt{70}$ must lie between 8 and 9 Calculate the LCM and HCF of a number when given the prime factorisation of each number Calculate the upper and lower bounds of a number to a given degree of accuracy Use upper and lower bounds for addition and subtraction calculations Estimate answers to calculations with the use of rounding numbers Multiply & divide integers and decimals by a number between 0-1 Add, subtract, multiply and divide mixed numbers
Algebra	<ul style="list-style-type: none"> Construct and solve linear equations that involve fractions and fractional answers Construct and solve linear inequalities Expand and factorise single and double brackets, including difference of two squares Substitute fractional and negative values into expressions Rearrange formulae and use to solve problems Calculate the equation of a line in the form $y=mx+c$
Ratio & Proportion	<ul style="list-style-type: none"> Calculate missing dimensions in similar shapes Calculate compound interest and depreciation after 2-5 years Write, simplify and divide a ratio given situations Convert between currencies Interpret and solve best buy deals
Geometry	<ul style="list-style-type: none"> Calculate the area and arc length of a sector Calculate the length of a line given two coordinates Define a geometric progression and continue a sequence Use and apply trigonometry to right-angled triangle, including worded problems Identify roots and turning points on a quadratic graph Calculate volumes of 3D shapes and prisms Transform shapes by reflecting, rotating, enlarging and translating (using column vectors) Use constructions to solve loci problems
Statistics	<ul style="list-style-type: none"> Construct and interpret pie charts Construct and interpret composite bar charts Display data with an appropriate graph Construct and interpret real-life graphs (including speed/distance/velocity graphs)
Probability	<ul style="list-style-type: none"> Write probabilities using fractions, percentages or decimals Use tree diagrams to calculate the probabilities of two dependant events Understand and use experimental and theoretical probability to calculate estimated outcomes Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values

Grade 4

<p>Number</p>	<p>Round decimals to any given accuracy Recognise equivalences and perform calculations with powers of 10 e.g.: 0.1, $1/10$, 10^{-1} Recall from memory the cubes of 1,2,3,4,5 & 10 Know and use the laws of indices e.g.: $a^m \times a^n$, a^m/a^n, $(a^m)^n$, a^0, a^1 Calculate the Lowest Common Multiple(LCM) & Highest Common Factor(HCF) using Venn diagrams Convert between ordinary numbers and numbers in standard form Add, subtract, multiply and divide numbers that are written in standard form</p> <p>Divide any integer by a decimal by converting to division by an integer e.g.: $6 \div 0.2 = \frac{6}{0.2} = \frac{60}{2}$</p> <p>Add, subtract, multiply and divide fractions; including different denominators Understand the term reciprocal and calculate reciprocals of any integer, decimal or fraction Convert simple fractions into recurring decimals using bus-stop method Calculate percentage increase and decrease Calculate simple interest</p>
<p>Algebra</p>	<p>Expand and simplify brackets including with negatives e.g.: $3(x + 4) - (x + 5)$ Construct and solve linear equations, including unknowns on both sides Construct, use and rearrange simple formulae Plot and solve inequalities on a number line Solve simultaneous equations graphically Identify and continue the Fibonacci sequence</p> <p>Add and subtract simple algebraic fractions e.g.: $\frac{2}{x} + \frac{1}{3x}$</p> <p>Plot quadratic functions with and without a calculator</p>
<p>Ratio & Proportion</p>	<p>Calculate density, mass, volume, speed, time and distance Calculate the linear scale factor of similar shapes Use proportional reasoning to compare proportions Compare two ratios Calculate the percentage increase or decrease</p>
<p>Geometry</p>	<p>Construct triangles accurately given SSS, ASA, SAS Use a ruler and compasses to bisect an angle Construct perpendicular lines Enlarge any shape given a positive scale factor Describe a rotation, reflection and translation on a co-ordinate grid Calculate the circumference and area of a semi-circle and quarter of a circle Calculate missing lengths using Pythagoras' Theorem Calculate interior, exterior and the sum of angles in polygons</p>
<p>Statistics</p>	<p>Apply and work out the fraction of each sector on a pie chart Draw and interpret distance-time graphs Calculate averages from frequency tables</p>
<p>Probability</p>	<p>Use $1 - p$ to calculate the probability of an event not occurring Calculate a missing probability from a list or table including algebraic terms Use a numerical scale from 0 to 1 to express and compare experimental and theoretical probabilities in a range of contexts. Compare relative frequencies from samples of different sizes Complete Venn diagrams and use union and intersection notation</p>

Grade 3

Number	Round decimals to one and two decimal places Round to a given significant figures Multiply and divide integers and decimals by 0.1 and 0.01 Multiply and divide decimals Convert integers into standard form Use positive and negative square roots, cube and cube roots Use index notation for small positive integer powers Write an integer as a product of its prime factors Convert between improper and mixed fractions Use written division methods to convert a fraction to a decimal Multiply integers by fractions Compare & Order fractions, including those with different denominators Add and subtract fractions by converting one fraction Order decimals, including those which have a different number of decimal places Use inequality signs to show comparisons between two fractions, or decimals Calculate percentages of amounts, using multipliers Increase and decrease an amount by a given percentage and solve reverse percentage problems
Algebra	Expand, factorise and simplify a single bracket Substitute positive and negative integers into expressions and formulae Calculate inputs and outputs from function machines, including negatives Calculate and generate a sequence from the <i>n</i> th term Know the first five triangular numbers and to be able to continue the sequence Calculate the midpoint of a line on a coordinate grid Solve problems involving shapes on coordinate grid Plot equations of line in form $y=mx+c$ and identify the gradient
Ratio & Proportion	Convert between miles and kilometres Convert between imperial units and currencies when conversions are given Share an amount in a given ratio Use ratio to compare scale drawings to real life Use equivalent fractions/decimals and percentages to compare proportions Express a number as a percentage of another
Geometry	Calculate the volume of a prism and cuboid Calculate the surface area of prism and calculate the area of a trapezium Identify and name parts of circle and calculate the circumference and area of a circle Identify and calculate angles in parallel lines e.g.: alternate, corresponding & allied Calculate angles in isosceles and equilateral triangles Draw and find bearings Describe rotations, translations and reflections Identify congruent shapes
Statistics	Draw and interpret scatter graphs including line of best fit Calculate the modal class from grouped data Plan and construct two-way tables
Probability	Understand that the sum of probabilities of all mutually exclusive outcomes is 1 List all outcomes systematically Draw sample space diagrams for two events Add simple probabilities Estimate the number of times an event will occur Interpret results of an experiment using the language of probability Compare estimated experimental probabilities with theoretical probabilities Work out probabilities from Venn diagrams

Grade 2

Number	<p>Order, add and subtract positive and negative integers within contexts</p> <p>Round decimals to the nearest integer</p> <p>Multiply & divide any integer or decimal by powers of 10</p> <p>Understand and use decimal notation and place value</p> <p>Add and subtract decimals, including those with differing number of decimal places</p> <p>Use written methods to multiply & divide up to three-digit numbers by a two-digit number</p> <p>Multiply & divide decimals with up to two places by single-digit whole numbers</p> <p>Use a calculator to calculate square and cube roots</p> <p>Identify and calculate highest common factors and lowest common multiples in contexts</p> <p>List and simplify equivalent fractions</p> <p>Express one number as a fraction of another and simplify</p> <p>Convert between fractions, decimals and percentages</p> <p>Calculate percentages of amounts</p>
Algebra	<p>Plot coordinates in all four quadrants</p> <p>Identify, expressions, terms, equations and formulae</p> <p>Simplify linear expressions</p> <p>Multiply terms including single brackets by a positive integer</p> <p>Calculate a term-to-term rule and continue a sequence</p> <p>Generate sequences from patterns</p> <p>Show inequalities on a number line</p> <p>Give numbers that satisfy inequalities</p> <p>Calculate the input and output of function machines (positive integers only)</p>
Ratio & Proportion	<p>Convert between metric units</p> <p>Write and interpret a ratio given a diagram or context</p> <p>Solve proportion problems using the unitary method</p> <p>Compare products to work out best buy using simple proportions</p> <p>Calculate speed, distance and time given situations</p> <p>Solve ratio problems involving recipes</p>
Geometry	<p>Identify and calculate angles on a straight line, around a point and vertically opposite</p> <p>Measure and draw angles to nearest degree</p> <p>Construct a triangle given sides and angles</p> <p>Calculate missing angles in triangles and quadrilaterals</p> <p>Identify properties of 3D shapes</p> <p>Identify and construct nets of common 3D shapes</p> <p>Draw plans and elevations of 3D shapes</p> <p>Draw a 3D shape from plans and elevations</p> <p>Reflect, translate and rotate a shape</p> <p>Classify quadrilaterals and triangles given their properties</p> <p>Calculate the area and perimeter of rectangles/squares/triangles</p> <p>Calculate area and perimeter of compound shapes involving rectangles</p>
Statistics	<p>Draw and interpret frequency diagrams for discrete and continuous data</p> <p>Calculate the mode, median, mean and range from sets of data</p> <p>Draw and interpret line graphs</p>
Probability	<p>Understand and use the probability scale from 0 to 1</p> <p>Write probabilities in words or fractions, decimals and percentages</p> <p>Calculate the probability of an event happening using theoretical probability</p> <p>List all outcomes using dice, spinners and coins</p> <p>Calculate the probability of an event happening using relative frequency</p>

Grade 1

Number	<p>Read, write and order integers, up to and including 4 digit numbers</p> <p>Use mental methods to add and subtract positive and negative integers</p> <p>Use written methods to multiply & divide up to 3-digit numbers by a single-digit number</p> <p>Multiply and divide whole numbers by powers of 10</p> <p>Understand and apply BIDMAS</p> <p>Understand and use inverse operations</p> <p>Identify square numbers, up to 144</p> <p>Recognise odd and even numbers</p> <p>Know the definition of a prime number and be able to list the first 10 prime numbers</p> <p>Know the definition of multiples and factors and to be able to list them</p> <p>Round whole numbers to the nearest 10, 100 and 1000</p> <p>Use vocabulary associated with fractions such as numerator and denominator</p> <p>Understand and use fraction notation</p> <p>Use diagrams to find equivalent fractions and to make comparisons</p> <p>Convert simple fractions into decimals, such as tenths and hundredths</p> <p>Read from scales and measures</p> <p>Use the 'less than' and 'greater than' symbols</p>
Algebra	<p>Write and plot coordinates in the positive quadrant</p> <p>Multiply, divide, add and subtract basic algebra e.g.: $a + a$, $2 \times a$, $a/2$, $3a - a$</p> <p>Write expressions using algebraic notation e.g.: I think of a number times it by 2 and add 5</p>
Ratio & Proportion	<p>Convert fractions to a ratio, e.g. $1/3$ and $1/2$ shown in the ratio 1:2</p> <p>Write ratios in their simplest form</p> <p>Solve simple problems involving direct proportion</p>
Geometry	<p>Know the definition of regular and irregular polygon</p> <p>Know the names of regular polygons up to decagon</p> <p>Name the different angles, acute, obtuse, right-angle and reflex</p> <p>Understand the definition of parallel and perpendicular lines</p> <p>Understand the properties of different quadrilaterals and triangles</p> <p>Understand the definition of line symmetry and rotational symmetry</p> <p>Draw lines of symmetry on basic shapes as well as give order of rotational symmetry</p> <p>Understand the definition of congruency and draw tessellations</p>
Statistics	<p>Collect discrete data and record results using a frequency table</p> <p>Draw a bar chart for discrete data</p> <p>Calculate the total population from a bar chart or table</p> <p>Find greatest and least values from a bar chart or table</p> <p>Use the mode and range to describe sets of data</p> <p>Read information and work out totals from a pictogram</p> <p>Represent information as a pictogram (where the symbol represents 1 or 2 units)</p>
Probability	<p>Discuss events using words such as likely, unlikely, certain and impossible</p> <p>Place the probability of events on a scale from impossible to certain</p> <p>Find probabilities based on equally likely outcomes in simple contexts</p> <p>List all outcomes for single events systematically</p>

Foundation +

Number	<p>Calculations - add, subtract, multiply and divide positive using both mental and written methods</p> <p>Negative numbers – recognise in contexts such as temperature</p> <p>Fractions and decimals – use simple fractions and recognise when two simple fraction are equivalent</p> <p>Place value – state the place value of numbers up to thousands</p>
Algebra	<p>Sequences – recognise simple patterns of numbers</p>
Geometry	<p>3d shapes – state the number of edges, faces and vertices on a cube</p> <p>Transformations – recognise simple reflections and rotations of shapes</p> <p>Angles – recognise compass directions, right angles and turns</p> <p>Straight Lines – draw and measure lines in cm accurately</p>
Statistics	<p>Charts – interpret simple bar charts and pictograms</p> <p>Averages – find the mode, mean, median and range of a set of simple data</p> <p>Data – extract and interpret information presented in simple tables, lists, bar charts and pictograms</p>