

# CoDA Curriculum

# MATHEMATICS



**Please ask your child what stage they are on, then check the curriculum for that stage.**

All students in Year 11 will be entered for following specification(s): **AQA Level 1/Level 2 GCSE (9-1) in Mathematics.**

Some students will also be entered for: **AQA Entry Level Certificate in Mathematics.**

### Why study MATHEMATICS?

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

### MATHEMATICS Curriculum INTENT Y7-9 (based upon the National Curriculum, 2013)

#### The Maths Curriculum aims to ensure that all students:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

WORKING MATHEMATICALLY		
Develop fluency	Reason mathematically	Solve problems
<p>Students will be taught to:</p> <ul style="list-style-type: none"> <li>• consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots</li> <li>• select and use appropriate calculation strategies to solve increasingly complex problems</li> <li>• use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships</li> <li>• substitute values in expressions, rearrange and simplify expressions, and solve equations</li> <li>• move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs]</li> <li>• develop algebraic and graphical fluency, including understanding linear and simple quadratic functions</li> <li>• use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics</li> </ul>	<p>Students will be taught to:</p> <ul style="list-style-type: none"> <li>• extend their understanding of the number system; make connections between number relationships, and their algebraic and graphical representations</li> <li>• extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically</li> <li>• identify variables and express relations between variables algebraically and graphically</li> <li>• make and test conjectures about patterns and relationships; look for proofs or counter examples</li> <li>• begin to reason deductively in geometry, number and algebra, including using geometrical constructions</li> <li>• interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning</li> <li>• explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally</li> </ul>	<p>Students will be taught to:</p> <ul style="list-style-type: none"> <li>• develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems</li> <li>• develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics</li> <li>• begin to model situations mathematically and express the results using a range of formal mathematical representations</li> <li>• select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems</li> </ul>
SUBJECT CONTENT		
Number	Algebra	Ratio, proportion and rates of change
Geometry and measures	Probability	Statistics

### MATHEMATICS Curriculum INTENT Y10-11 (AQA GCSE MATHEMATICS)

Students will be taught and assessed on their ability to...		
AO1	Use and apply standard techniques	<ul style="list-style-type: none"> <li>• accurately recall facts, terminology and definitions</li> <li>• use and interpret notation correctly</li> <li>• accurately carry out routine procedures or set tasks requiring multi-step solutions.</li> </ul>
AO2	Reason, interpret and communicate mathematically	<ul style="list-style-type: none"> <li>• make deductions, inferences and draw conclusions from mathematical information</li> <li>• construct chains of reasoning to achieve a given result</li> <li>• interpret and communicate information accurately</li> <li>• present arguments and proofs</li> <li>• assess the validity of an argument and critically evaluate a given way of presenting information.</li> </ul>
AO3	Solve problems within mathematics and in other contexts	<ul style="list-style-type: none"> <li>• translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes</li> <li>• make and use connections between different parts of mathematics</li> <li>• interpret results in the context of the given problem</li> <li>• evaluate methods used and results obtained</li> <li>• evaluate solutions to identify how they may have been affected by assumptions made.</li> </ul>

## MATHEMATICS ENTRY LEVEL CERTIFICATE YEAR 7

AUTUMN 1	SPRING 1	SUMMER 1
3.1 Identify or show unit fractions up to one tenth of a quantity up to 100 3.2 Work out unit fractions to one tenth of a number up to 100	3.5 Recognise and identify equivalent fractions 3.6 Add and subtract with the same denominator within one whole	3.1 Add and subtract using 3-digit numbers 3.2 Multiply a 2-digit whole number by a single digit whole number 3.3 Divide a 2-digit whole number by a single digit whole number 3.4 Use and interpret +, -, ×, ÷ and = in real-life situations to solve problems
AUTUMN 2	SPRING 2	SUMMER 2
3.3 Identify or show any number of thirds, quarters, fifths or tenths of a quantity 3.4 Work out any number of thirds, quarters, fifths or tenths of an amount	3.7 Work out amounts 5, 8, or 10 times the size of a given amount 3.1 Add and subtract using 3-digit numbers	3.5 Use inverse operations to find missing answers 3.6 Estimate the answer to a calculation 3.7 Recall and use multiplication facts for the 3, 4 and 8 multiplication tables

## MATHEMATICS ENTRY LEVEL CERTIFICATE YEAR 8

AUTUMN 1	SPRING 1	SUMMER 1
3.1 Read and write numbers up to 1000 3.2 Order and compare numbers up to 1000 3.3 Recognise place value in 3-digit numbers 3.4 Round numbers less than 1000 to the nearest 10	3.1 Add lengths, capacities and weights and compare the total to another total or a requirement 3.2 Convert standard units of length, capacity and weight	3.5 Choose an appropriate measuring instrument 3.6 Read values from an appropriate scale
AUTUMN 2	SPRING 2	SUMMER 2
3.5 Round numbers to the less than 1000 to the nearest 100 3.6 Find 10 or 100 more or less than a given number 3.7 Recognise and use multiples of 2, 3, 4, 5, 8, 10, 50, 100	3.3 Compare and order lengths, capacities and weights in different standard units 3.4 Measure the perimeter of a simple shape	3.7 Read and compare temperatures including temperatures with negative values

## MATHEMATICS ENTRY LEVEL CERTIFICATE YEAR 9

AUTUMN 1	SPRING 1	SUMMER 1
3.1 Read and write numbers up to 1000 3.2 Order and compare numbers up to 1000 3.3 Recognise place value in 3-digit numbers 3.4 Round numbers less than 1000 to the nearest 10	3.1 Identify or show unit fractions up to one tenth of a quantity up to 100 3.2 Work out unit fractions to one tenth of a number up to 100 3.3 Identify or show any number of thirds, quarters, fifths or tenths of a quantity 3.4 Work out any number of thirds, quarters, fifths or tenths of an amount	3.1 Add and subtract using 3-digit numbers 3.2 Multiply a 2-digit whole number by a single digit whole number 3.3 Divide a 2-digit whole number by a single digit whole number 3.4 Use and interpret +, -, ×, ÷ and = in real-life situations to solve problems
AUTUMN 2	SPRING 2	SUMMER 2
3.5 Round numbers to the less than 1000 to the nearest 100 3.6 Find 10 or 100 more or less than a given number 3.7 Recognise and use multiples of 2, 3, 4, 5, 8, 10, 50, 100	3.5 Recognise and identify equivalent fractions 3.6 Add and subtract with the same denominator within one whole 3.7 Work out amounts 5, 8, or 10 times the size of a given amount	3.5 Use inverse operations to find missing answers 3.6 Estimate the answer to a calculation 3.7 Recall and use multiplication facts for the 3, 4 and 8 multiplication tables

# MATHEMATICS ENTRY LEVEL CERTIFICATE YEAR 10

AUTUMN 1	SPRING 1	SUMMER 1
3.1 Read and write numbers up to 1000 3.2 Order and compare numbers up to 1000 3.3 Recognise place value in 3-digit numbers 3.4 Round numbers less than 1000 to the nearest 10 3.5 Round numbers to the less than 1000 to the nearest 100 3.6 Find 10 or 100 more or less than a given number 3.7 Recognise and use multiples of 2, 3, 4, 5, 8, 10, 50, 100	3.1 Identify or show unit fractions up to one tenth of a quantity up to 100 3.2 Work out unit fractions to one tenth of a number up to 100 3.3 Identify or show any number of thirds, quarters, fifths or tenths of a quantity 3.4 Work out any number of thirds, quarters, fifths or tenths of an amount 3.5 Recognise and identify equivalent fractions 3.6 Add and subtract with the same denominator within one whole 3.7 Work out amounts 5, 8, or 10 times the size of a given amount	3.1 Solve problems involving time 3.2 Know that there are 365 days in a year, 366 days in a leap year, 12 months in a year and 52 full weeks in a year 3.3 Use a calendar and write the date correctly (day/month/year) 3.4 Tell and write the time from an analogue clock, including using Roman numerals from I to XII 3.5 Understand and use the 12-hour and 24-hour clock systems and convert from one system to the other 3.6 Convert between hours, minutes and seconds 3.7 Add up to three lengths of time given in minutes and hours
AUTUMN 2	SPRING 2	SUMMER 2
3.1 Add and subtract using 3-digit numbers 3.2 Multiply a 2-digit whole number by a single digit whole number 3.3 Divide a 2-digit whole number by a single digit whole number 3.4 Use and interpret +, -, ×, ÷ and = in real-life situations to solve problems 3.5 Use inverse operations to find missing answers 3.6 Estimate the answer to a calculation 3.7 Recall and use multiplication facts for the 3, 4 and 8 multiplication tables	3.1 Appreciate the purchasing power of amounts of money (notes) 3.2 Exchange notes for an equivalent value in coins 3.3 Use decimal notation for money 3.4 Interpret a calculator display 3.5 Solve real life problems involving what to buy and how to pay 3.6 Add amounts of money and give change 3.7 Carry out investigations involving money	3.1 Add lengths, capacities and weights and compare the total to another total or a requirement 3.2 Convert standard units of length, capacity and weight 3.3 Compare and order lengths, capacities and weights in different standard units 3.4 Measure the perimeter of a simple shape 3.5 Choose an appropriate measuring instrument 3.6 Read values from an appropriate scale 3.7 Read and compare temperatures including temperatures with negative values

# MATHEMATICS STAGE 5 (Years 7-11)

AUTUMN 1	SPRING 1	SUMMER 1
<ul style="list-style-type: none"> <li>• identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers</li> <li>• know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers</li> <li>• establish whether a number up to 100 is prime and recall prime numbers up to 19</li> <li>• recognise and use square numbers and cube numbers, and the notation for squared (<math>^2</math>) and cubed (<math>^3</math>)</li> <li>• solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes</li> <li>• read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit</li> <li>• read Roman numerals to 1000 (M) and recognise years written in Roman numerals</li> <li>• interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero</li> <li>• add and subtract numbers mentally with increasingly large numbers</li> <li>• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)</li> <li>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</li> </ul>	<ul style="list-style-type: none"> <li>• recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents</li> <li>• read and write decimal numbers as fractions [for example, <math>0.71 = 71/100</math>]</li> <li>• read, write, order and compare numbers with up to three decimal places</li> <li>• recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal</li> <li>• solve problems involving number up to three decimal places</li> <li>• convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)</li> <li>• understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints</li> <li>• use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling</li> <li>• know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles</li> </ul>	<ul style="list-style-type: none"> <li>• estimate volume [for example, using <math>1 \text{ cm}^3</math> blocks to build cuboids (including cubes)] and capacity [for example, using water]</li> <li>• round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000</li> <li>• round decimals with two decimal places to the nearest whole number and to one decimal place</li> <li>• use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy</li> <li>• identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed</li> </ul>
AUTUMN 2	SPRING 2	SUMMER 2
<ul style="list-style-type: none"> <li>• multiply and divide numbers mentally drawing upon known facts</li> <li>• multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</li> <li>• multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers</li> <li>• divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context</li> <li>• solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign</li> <li>• use the properties of rectangles to deduce related facts and find missing lengths and angles</li> <li>• distinguish between regular and irregular polygons based on reasoning about equal sides and angles</li> <li>• compare and order fractions whose denominators are all multiples of the same number</li> <li>• identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths</li> </ul>	<ul style="list-style-type: none"> <li>• draw given angles, and measure them in degrees (<math>^\circ</math>)</li> <li>• identify angles at a point and one whole turn (total <math>360^\circ</math>); angles at a point on a straight line and <math>1/2</math> a turn (total <math>180^\circ</math>); other multiples of <math>90^\circ</math></li> <li>• recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements <math>&gt; 1</math> as a mixed number [for example, <math>2/5 + 4/5 = 6/5 = 1 \frac{1}{5}</math>]</li> <li>• add and subtract fractions with the same denominator and denominators that are multiples of the same number</li> <li>• multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams</li> <li>• solve problems which require knowing percentage and decimal equivalents of <math>1/2</math>, <math>1/4</math>, <math>1/5</math>, <math>2/5</math>, <math>4/5</math> and those fractions with a denominator of a multiple of 10 or 25</li> <li>• solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates</li> <li>• measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres</li> <li>• calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (<math>\text{cm}^2</math>) and square metres (<math>\text{m}^2</math>) and estimate the area of irregular shapes</li> </ul>	<ul style="list-style-type: none"> <li>• count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000</li> <li>• solve problems involving converting between units of time</li> <li>• complete, read and interpret information in tables, including timetables</li> <li>• solve comparison, sum and difference problems using information presented in a line graph</li> </ul>

# MATHEMATICS STAGE 6 (Years 7-11)

AUTUMN 1	SPRING 1	SUMMER 1
<ul style="list-style-type: none"> <li>• identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places</li> <li>• read, write, order and compare numbers up to 10 000 000 and determine the value of each digit</li> <li>• use negative numbers in context, and calculate intervals across zero</li> <li>• identify common factors, common multiples and prime numbers</li> <li>• solve problems which require answers to be rounded to specified degrees of accuracy</li> <li>• use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy</li> <li>• round any whole number to a required degree of accuracy</li> <li>• perform mental calculations, including with mixed operations and large numbers solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</li> <li>• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication</li> <li>• solve problems involving addition, subtraction and multiplication</li> <li>• use their knowledge of the order of operations to carry out calculations</li> </ul>	<ul style="list-style-type: none"> <li>• use simple formulae</li> <li>• convert between miles and kilometres</li> <li>• use common factors to simplify fractions; use common multiples to express fractions in the same denomination</li> <li>• compare and order fractions, including fractions <math>&gt; 1</math></li> <li>• associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, <math>\frac{3}{8}</math>]</li> <li>• recall and use equivalences between simple fractions, decimals and percentages, including in different contexts</li> <li>• solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts</li> <li>• solve problems involving similar shapes where the scale factor is known or can be found</li> <li>• solve problems involving unequal sharing and grouping using knowledge of fractions and multiples</li> </ul>	<ul style="list-style-type: none"> <li>• divide proper fractions by whole numbers [for example, <math>\frac{1}{3} \div 2 = \frac{1}{6}</math>]</li> <li>• multiply one-digit numbers with up to two decimal places by whole numbers</li> <li>• solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison</li> <li>• enumerate possibilities of combinations of two variables</li> <li>• express missing number problems algebraically</li> <li>• find pairs of numbers that satisfy an equation with two unknowns</li> </ul>
AUTUMN 2	SPRING 2	SUMMER 2
<ul style="list-style-type: none"> <li>• divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division; interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context</li> <li>• divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context</li> <li>• use written division methods in cases where the answer has up to two decimal places</li> <li>• solve problems involving division</li> <li>• draw 2-D shapes using given dimensions and angles</li> <li>• recognise, describe and build simple 3-D shapes, including making nets</li> <li>• compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons</li> <li>• illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius</li> </ul>	<ul style="list-style-type: none"> <li>• generate and describe linear number sequences</li> <li>• use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places</li> <li>• recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles</li> <li>• add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions</li> <li>• multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, <math>\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}</math>]</li> </ul>	<ul style="list-style-type: none"> <li>• recognise that shapes with the same areas can have different perimeters and vice versa</li> <li>• calculate the area of parallelograms and triangles</li> <li>• calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (<math>\text{cm}^3</math>) and cubic metres (<math>\text{m}^3</math>), and extending to other units [for example, <math>\text{mm}^3</math> and <math>\text{km}^3</math>]</li> <li>• recognise when it is possible to use formulae for area and volume of shape</li> <li>• solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate</li> <li>• describe positions on the full coordinate grid (all four quadrants)</li> <li>• draw and translate simple shapes on the coordinate plane, and reflect them in the axes</li> <li>• interpret and construct pie charts and line graphs and use these to solve problems</li> <li>• calculate and interpret the mean as an average</li> </ul>

# MATHEMATICS STAGE 7 (Years 7-11)

AUTUMN 1	SPRING 1	SUMMER 1
<ul style="list-style-type: none"> <li>• use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple</li> <li>• use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5</li> <li>• recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions</li> <li>• understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)</li> <li>• apply the four operations, including formal written methods, to integers and decimals</li> <li>• use conventional notation for priority of operations, including brackets</li> <li>• recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions)</li> </ul>	<ul style="list-style-type: none"> <li>• understand and use the concepts and vocabulary of expressions, equations, formulae and terms</li> <li>• use and interpret algebraic notation, including: <math>ab</math> in place of <math>a \times b</math>, <math>3y</math> in place of <math>y + y + y</math> and <math>3 \times y</math>, <math>a^2</math> in place of <math>a \times a</math>, <math>a^3</math> in place of <math>a \times a \times a</math>, <math>a/b</math> in place of <math>a \div b</math>, brackets</li> <li>• simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket</li> <li>• where appropriate, interpret simple expressions as functions with inputs and outputs</li> <li>• substitute numerical values into formulae and expressions</li> <li>• use conventional notation for priority of operations, including brackets</li> <li>• express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1</li> <li>• define percentage as 'number of parts per hundred'</li> <li>• express one quantity as a percentage of another</li> <li>• use ratio notation, including reduction to simplest form</li> <li>• divide a given quantity into two parts in a given part:part or part:whole ratio</li> </ul>	<ul style="list-style-type: none"> <li>• apply the four operations, including formal written methods, to simple fractions (proper and improper), and mixed numbers</li> <li>• interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively</li> <li>• compare two quantities using percentages</li> <li>• solve problems involving percentage change, including percentage increase/decrease</li> <li>• recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions)</li> <li>• solve linear equations in one unknown algebraically</li> </ul>
AUTUMN 2	SPRING 2	SUMMER 2
<ul style="list-style-type: none"> <li>• round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)</li> <li>• estimate answers; check calculations using approximation and estimation, including answers obtained using technology</li> <li>• recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions)</li> <li>• order positive and negative integers, decimals and fractions</li> <li>• use the symbols <math>=</math>, <math>\neq</math>, <math>&lt;</math>, <math>&gt;</math>, <math>\leq</math>, <math>\geq</math></li> <li>• use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries</li> <li>• use the standard conventions for labelling and referring to the sides and angles of triangles</li> <li>• draw diagrams from written description</li> <li>• identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres</li> <li>• derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language</li> </ul>	<ul style="list-style-type: none"> <li>• generate terms of a sequence from a term-to-term rule</li> <li>• use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)</li> <li>• use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate</li> <li>• change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts</li> <li>• measure line segments and angles in geometric figures</li> <li>• apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles</li> </ul>	<ul style="list-style-type: none"> <li>• use standard units of measure and related concepts (length, area, volume/capacity)</li> <li>• calculate perimeters of 2D shapes</li> <li>• know and apply formulae to calculate area of triangles, parallelograms, trapezia know and apply formulae to calculate volume of cuboids</li> <li>• understand and use standard mathematical formulae</li> <li>• work with coordinates in all four quadrants</li> <li>• solve geometrical problems on coordinate axes</li> <li>• identify, describe and construct congruent shapes including on coordinate axes, by considering rotation, reflection and translation</li> <li>• describe translations as 2D vectors</li> <li>• interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use</li> <li>• interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean and mode) and spread (range)</li> </ul>

# MATHEMATICS STAGE 8 (Years 7-11)

AUTUMN 1	SPRING 1	SUMMER 1
<ul style="list-style-type: none"> <li>• use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem</li> <li>• round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)</li> <li>• interpret standard form <math>\times 10^n</math>, where <math>1 \leq &lt; 10</math> and <math>n</math> is an integer</li> <li>• apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative</li> <li>• use conventional notation for priority of operations, including brackets, powers, roots and reciprocals</li> <li>• measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings</li> <li>• identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement</li> </ul>	<ul style="list-style-type: none"> <li>• work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and <math>\frac{7}{2}</math> or 0.375 or <math>\frac{3}{8}</math>)</li> <li>• express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)</li> <li>• identify and work with fractions in ratio problems</li> <li>• understand and use proportion as equality of ratios</li> <li>• express a multiplicative relationship between two quantities as a ratio or a fraction</li> <li>• use compound units (such as speed, rates of pay, unit pricing)</li> <li>• change freely between compound units (e.g. speed, rates of pay, prices) in numerical contexts</li> <li>• relate ratios to fractions and to linear functions</li> <li>• generate terms of a sequence from either a term-to-term or a position-to-term rule</li> <li>• deduce expressions to calculate the <math>n</math>th term of linear sequences</li> <li>• understand and use alternate and corresponding angles on parallel lines</li> <li>• derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)</li> </ul>	<ul style="list-style-type: none"> <li>• calculate areas of circles and composite shapes</li> <li>• know and apply formulae to calculate volume of right prisms (including cylinders)</li> <li>• plot graphs of equations that correspond to straight-line graphs in the coordinate plane</li> <li>• identify and interpret gradients and intercepts of linear functions graphically</li> <li>• recognise, sketch and interpret graphs of linear functions and simple quadratic functions</li> <li>• plot and interpret graphs and graphs of non-standard ( functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance and speed</li> </ul>
AUTUMN 2	SPRING 2	SUMMER 2
<ul style="list-style-type: none"> <li>• interpret plans and elevations of 3D shapes</li> <li>• use scale factors, scale diagrams and maps</li> <li>• relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale</li> <li>• record describe and analyse the frequency of outcomes of probability experiments using tables</li> <li>• construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities</li> <li>• apply the property that the probabilities of an exhaustive set of outcomes sum to one</li> <li>• use and interpret algebraic notation, including: <math>a^2</math> in place of <math>a \times a</math> , coefficients written as fractions rather than as decimals</li> <li>• understand and use the concepts and vocabulary of factors</li> <li>• simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices</li> <li>• substitute numerical values into scientific formulae</li> <li>• rearrange formulae to change the subject</li> </ul>	<ul style="list-style-type: none"> <li>• interpret fractions and percentages as operators</li> <li>• work with percentages greater than 100%</li> <li>• solve problems involving percentage change, including original value problems, and simple interest including in financial mathematics</li> <li>• calculate exactly with fractions</li> <li>• solve linear equations with the unknown on both sides of the equation</li> <li>• find approximate solutions to linear equations using a graph</li> <li>• compare lengths, areas and volumes using ratio notation</li> <li>• calculate perimeters of 2D shapes, including circles</li> <li>• identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference</li> <li>• know the formulae: circumference of a circle = <math>2\pi r = \pi d</math>, area of a circle = <math>\pi r^2</math></li> </ul>	<ul style="list-style-type: none"> <li>• apply systematic listing strategies</li> <li>• record describe and analyse the frequency of outcomes of probability experiments using frequency trees</li> <li>• enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams</li> <li>• construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments</li> <li>• interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data</li> <li>• use and interpret scatter graphs of bivariate data</li> <li>• recognise correlation</li> <li>• interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)</li> <li>• apply statistics to describe a population</li> </ul>

# MATHEMATICS STAGE 9 (Years 7-11)

AUTUMN 1	SPRING 1	SUMMER 1
<ul style="list-style-type: none"> <li>• calculate with roots, and with integer indices</li> <li>• calculate with standard form <math>A \times 10^n</math>, where <math>1 \leq A &lt; 10</math> and <math>n</math> is an integer</li> <li>• use inequality notation to specify simple error intervals due to truncation or rounding</li> <li>• apply and interpret limits of accuracy</li> <li>• use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle)</li> <li>• use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line</li> <li>• construct plans and elevations of 3D shapes</li> </ul>	<ul style="list-style-type: none"> <li>• recognise and use Fibonacci type sequences, quadratic sequences</li> <li>• understand and use the concepts and vocabulary of inequalities</li> <li>• solve linear inequalities in one variable</li> <li>• represent the solution set to an inequality on a number line</li> <li>• identify and apply circle definitions and properties, including: tangent, arc, sector and segment</li> <li>• calculate arc lengths, angles and areas of sectors of circles</li> </ul>	<ul style="list-style-type: none"> <li>• identify and interpret gradients and intercepts of linear functions algebraically</li> <li>• use the form <math>y = mx + c</math> to identify parallel lines</li> <li>• find the equation of the line through two given points, or through one point with a given gradient</li> <li>• interpret the gradient of a straight line graph as a rate of change</li> <li>• recognise, sketch and interpret graphs of quadratic functions</li> <li>• recognise, sketch and interpret graphs of simple cubic functions and the reciprocal function <math>y = 1/x</math> with <math>x \neq 0</math></li> <li>• plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration</li> <li>• solve, in simple cases, two linear simultaneous equations in two variables algebraically</li> <li>• derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution</li> <li>• find approximate solutions to simultaneous equations using a graph</li> </ul>
AUTUMN 2	SPRING 2	SUMMER 2
<ul style="list-style-type: none"> <li>• understand and use the concepts and vocabulary of identities</li> <li>• know the difference between an equation and an identity</li> <li>• simplify and manipulate algebraic expressions by expanding products of two binomials and factorising quadratic expressions of the form <math>x^2 + bx + c</math></li> <li>• argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments</li> <li>• translate simple situations or procedures into algebraic expressions or formulae</li> <li>• solve problems involving direct and inverse proportion including graphical and algebraic representations</li> <li>• apply the concepts of congruence and similarity, including the relationships between lengths in similar figures</li> <li>• change freely between compound units (e.g. density, pressure) in numerical and algebraic contexts</li> <li>• use compound units such as density and pressure</li> </ul>	<ul style="list-style-type: none"> <li>• identify and apply circle definitions and properties, including: tangent, arc, sector and segment</li> <li>• calculate arc lengths, angles and areas of sectors of circles</li> <li>• calculate surface area of right prisms (including cylinders)</li> <li>• calculate exactly with multiples of <math>\pi</math> know the formulae for: Pythagoras' theorem, <math>a^2 + b^2 = c^2</math>, and apply it to find lengths in right-angled triangles in two dimensional figures</li> <li>• use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)</li> <li>• apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs</li> </ul>	<ul style="list-style-type: none"> <li>• calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</li> <li>• enumerate sets and combinations of sets systematically, using tree diagrams</li> <li>• understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size</li> <li>• interpret and construct tables, charts and diagrams, including tables and line graphs for time series data and know their appropriate use</li> <li>• draw estimated lines of best fit; make predictions</li> <li>• know correlation does not indicate causation; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing</li> </ul>

# MATHEMATICS STAGE 10 (Years 7-11)

AUTUMN 1	SPRING 1	SUMMER 1
<ul style="list-style-type: none"> <li>• make links to similarity (including trigonometric ratios) and scale factors</li> <li>• know the exact values of <math>\sin\theta</math> and <math>\cos\theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of <math>\tan\theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ</math> and <math>60^\circ</math></li> <li>• know the trigonometric ratios, <math>\sin\theta = \text{opposite/hypotenuse}</math>, <math>\cos\theta = \text{adjacent/hypotenuse}</math>, <math>\tan\theta = \text{opposite/adjacent}</math></li> <li>• apply it to find angles and lengths in right-angled triangles in two dimensional figures</li> <li>• estimate powers and roots of any given positive number</li> <li>• calculate with roots, and with integer and fractional indices</li> <li>• calculate exactly with surds</li> <li>• apply and interpret limits of accuracy, including upper and lower bounds</li> </ul>	<ul style="list-style-type: none"> <li>• interpret equations that describe direct and inverse proportion</li> <li>• recognise and interpret graphs that illustrate direct and inverse proportion</li> <li>• understand that X is inversely proportional to Y is equivalent to X is proportional to <math>1/Y</math></li> <li>• deduce expressions to calculate the nth term of quadratic sequences</li> <li>• recognise and use simple geometric progressions (<math>rn</math> where n is an integer, and r is a rational number <math>&gt; 0</math>)</li> <li>• solve linear inequalities in two variables</li> <li>• represent the solution set to an inequality using set notation and on a graph</li> </ul>	<ul style="list-style-type: none"> <li>• interpret the gradient at a point on a curve as the instantaneous rate of change identify and interpret roots, intercepts, turning points of quadratic functions graphically</li> <li>• change recurring decimals into their corresponding fractions and vice versa</li> <li>• set up, solve and interpret the answers in growth and decay problems, including compound interest</li> <li>• solve linear inequalities in two variables</li> <li>• represent the solution set to an inequality using set notation and on a graph</li> </ul>
AUTUMN 2	SPRING 2	SUMMER 2
<ul style="list-style-type: none"> <li>• solve linear inequalities in two variables</li> <li>• represent the solution set to an inequality using set notation and on a graph</li> <li>• calculate surface area and volume of spheres, pyramids, cones and composite solids</li> <li>• apply the concepts of congruence and similarity, including the relationships between length, areas and volumes in similar figures</li> <li>• simplify and manipulate algebraic expressions involving algebraic fractions</li> <li>• manipulate algebraic expressions by expanding products of more than two binomials</li> <li>• simplify and manipulate algebraic expressions (including those involving surds) by expanding products of two binomials and factorising quadratic expressions of the form <math>x^2 + bx + c</math>, including the difference of two squares</li> <li>• manipulate algebraic expressions by factorising quadratic expressions of the form <math>ax^2 + bx + c</math></li> <li>• interpret equations that describe direct and inverse proportion</li> <li>• recognise and interpret graphs that illustrate direct and inverse proportion</li> <li>• understand that X is inversely proportional to Y is equivalent to X is proportional to <math>1/Y</math></li> </ul>	<ul style="list-style-type: none"> <li>• calculate surface area and volume of spheres, pyramids, cones and composite solids</li> <li>• apply the concepts of congruence and similarity, including the relationships between length, areas and volumes in similar figures</li> <li>• apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results</li> <li>• plot and interpret graphs (including exponential graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration</li> <li>• calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts</li> </ul>	<ul style="list-style-type: none"> <li>• apply systematic listing strategies including use of the product rule for counting calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams.</li> <li>• infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling</li> <li>• construct and interpret diagrams for grouped discrete data and continuous data, i.e. cumulative frequency graphs, and know their appropriate use</li> <li>• interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data, including box plots</li> <li>• interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency including quartiles and inter-quartile range</li> <li>• use the form <math>y = mx + c</math> to identify perpendicular lines</li> <li>• recognise and use the equation of a circle with centre at the origin</li> <li>• find the equation of a tangent to a circle at a given point</li> <li>• apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors</li> </ul>