MATHS: FIVE YEAR CURRICULUM MAP *(HIGHER)*

CHASE TERRACE ACADEMY

INTRODUCTION & CURRICULUM INTENT

At Chase Terrace Academy we aspire for all of our students to achieve greater things than they ever thought possible.
We pride ourselves on being a warm and welcoming school that places community at the heart of everything we do. Our ambitious curriculum is enriching and inclusive, providing challenge and breadth for all. This empowers our students to become compassionate, confident and creative individuals who are resilient, respectful and equipped with a desire to take up a fulfilling role in society and the wider world.
In Mathematics, our aim is to see every Chase Terrace student enjoy and succeed at Maths, from mastering key techniques to more advanced problem-solving and mathematical thinking, meeting plenty of real-life skills along the way. We strive to develop students' confidence in their own abilities, and encourage them to challenge themselves and to develop as independent learners.

This curriculum is designed to provide full coverage of the National Curriculum at KS3 and KS4. There is no fixed point of transition between the key stages: learning is structured over the full five years to provide a natural development of skills and knowledge, interlinking of different areas of maths, interleaving of previously-met mathematical content, and challenge for all learners.

Our two curriculum maps, titled 'Higher' and 'Foundation', give an indication of how the journey might look for a student who ends up taking a Higher or Foundation tier GCSE. However, the path is not fixed: regular formative and summative assessment are used to ensure that each student is encountering the right learning for them at each stage, providing ample opportunity to move between 'tiers', right up to Year 11.

Further detail to inform application of the curriculum is provided in the individual schemes of work.

SUBJECT CONTENT (Ctrl-Click to follow hyperlink)

NUMBER	RATIO & PROPORTION	ALGEBRA	GEOMETRY & MEASURES	STATISTICS	PROBABILITY
Place Value Approximation Integer Arithmetic Calculators Order of Operations Negatives Decimals Fractions Percentage FDP Conversion Multiples, Factors & Primes Powers	Ratio Growth Proportion	Vocab & Notation Expressions Brackets Functions Graphs Formulae Equations Inequalities Sequences	2D Shape Congruence & Similarity Transformation Perimeter, Area, Volume Angles 3D Solids Units Construction	Collection Statistics Charts	Probability

KEY TO COLOUR CODING

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
STRAND	YEAR	BLACK: Content of Y7-11 Schemes of Work PURPLE: Objectives from KS2 Programme of Study	GREEN: Objectives from KS3 Programme of Study BLACK: Additional notes for clarification	RED: Objectives from KS4 Programme of Study: Content that should taught to all pupils **RED/BOLD: Objectives from KS4 Programme of Study: Content to be taught to more highly attaining pupils** BLACK: Additional notes for clarification	BLUE: OCR 'Initial learning for this qualification will enable learners to' BLUE/UNDERLINED: OCR 'Foundation tier learners should also be able to' **BLACK/BOLD: OCR 'Higher tier learners should additionally be able to'** BLACK: Additional notes for clarification

AIMS OF THE NATIONAL CURRICULUM

The national curriculum for mathematics aims to ensure that all pupils:-

- 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

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
PLACE VALUE & ORDERING	NC Y5	Count forwards/backwards in powers of 10 for any given number up to 1 million Read/write/order/compare numbers to 1 million Read Roman numerals to 1000 and recognise years Relate thousandths to tenths and hundredths			
	NC Y6	Understand and use place value in numbers to 10 million Read/write/order/compare numbers up to 10 million			
	Y7	Represent/understand integers in a dot place-value chart Identify the value of each digit in an integer of any size; understand the need for placeholder zeros Write large integers in words and figures Use integers given in words e.g. find five thousand more than 2 103 600 Find the value of each interval on an integer number line Understand that there are infinitely many positive integers, and infinitely many decimal numbers between each pair of integers Position integers on a number line Compare integers using =, ≠, <, > Order a list of integers, including the results of calculations Understand/use place value in decimals with up to 3dp Position decimals on a number line Order decimal numbers given in words or figures Compare simple fractions, decimals and percentages: tenths, hundredths, quarters and fifths Compare fractions using simple equivalent fractions Compare and order directed numbers Order a mixture of ordinary and standard form numbers (**H**)	Use the number line as a model for ordering of the real numbers Appreciate the infinite nature of the sets of integers, real and rational numbers Understand and use place value for decimals, measures and integers of any size Use the symbols =, ≠, <, >, ≤, ≥ to compare numbers Order positive and negative integers, decimals and fractions		Use <, >, ≤, ≥, =, ≠ Understand and use place value in integers Understand and use place value in decimals
	Y8	Order numbers given in standard form	Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero		
	Y9	Order combinations of fractions, decimals and percentages	Order positive and negative integers, decimals and fractions, and combinations of these		Order integers, fractions, decimals and percentages, and combinations of these, including negative values
	Y10				
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
ROUNDING, ESTIMATING & CHECKING	NC Y5	Round any number up to 1 million to the nearest 10, 100, 1000, 10 000, 100 000 Round decimals with 2 decimal digits to the nearest integer or 1dp Use rounding to check answers and determine levels of accuracy			
	NC Y6	Round any whole number to a required degree of accuracy Use estimation to check answers and determine levels of accuracy Solve problems which require answers to be rounded to specific degrees of accuracy			
	Y7	Round integers to the nearest 10, 100, 1000, …, 1 million Round integers and decimals to 1sf and the nearest integer Make a sensible estimate for each value in a simple calculation; decide whether the answer will be an under-estimate or over-estimate Use estimation to check answers	Use approximation through rounding to estimate answers Round numbers and measures to an appropriate degree of accuracy e.g. to a number of decimal places or significant figures		Know that addition and subtraction, multiplication and division, and powers and roots, are inverse operations and use this to simplify and check calculations Estimate or check, without a calculator, the result of a calculation by using suitable approximations Round numbers to the nearest whole number, ten, hundred, etc.
	Y8	REVISE rounding integers to the nearest 10, 100, 1000, …, 1 million REVISE rounding integers and decimals to 1sf and to the nearest integer Round to any number of decimal places Estimate by rounding to 1sf, including squaring and cubing Write/use the error interval for a rounded number, using an inequality (**H**)			Round numbers to a given number of decimal places
	Y9	Round to any number of significant figures Identify the bounds or error interval for a continuous quantity that has been rounded to the nearest integer, 10, 100, 5, 20, or a given number of decimal places or significant figures Identify the minimum and maximum possible values of an integer quantity that has been rounded (e.g. number of people, number of items) Solve simple bounds problems involving one rounded quantity Estimate the result of a calculation which involves powers, roots and dividing by a decimal e.g. 0.41; use the symbol ≈	Calculate possible resulting errors expressed using inequality notation $a < x \leq b$	Apply and interpret limits of accuracy when rounding	Round numbers to a given number of significant figures Round answers to an appropriate level of accuracy Estimate or check, without a calculator, the result of more complex calculations including roots Use the symbol ≈ appropriately Use inequality notation to write down an error interval for a number or measurement rounded to a given degree of accuracy Apply and interpret limits of accuracy **Calculate the upper and lower bounds of a calculation using numbers rounded to a known degree of accuracy** **Understand the difference between bounds of discrete and continuous quantities**
	Y10	Estimate squares of decimal numbers up to 10, cubes of decimal numbers up to 5, square roots of numbers up to 150 and cube roots of numbers up to 20 REVISE identifying bounds and error intervals for both discrete and continuous quantities which have been rounded or truncated to the nearest integer, 10, 100, 5, 20, or a given number of decimal places or significant figures Truncate to a given number of decimal places; understand the difference between truncating and rounding Write an error interval for a value that has been truncated Solve a problem involving upper and lower bounds for one or more measurements		Apply and interpret limits of accuracy when truncating	Use inequality notation to write down an error interval for a number or measurement truncated to a given degree of accuracy
	Y11	Find the result of a formula using upper and lower bounds			

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
FOUR OPERATIONS WITH INTEGERS	NC Y5	Add/subtract mentally with increasingly large numbers Add/subtract numbers with more than 4 digits Solve multi-step addition/subtraction problems in context, choosing operations and methods Add/subtract mentally using known facts Multiply up to ThHTU x TU on paper Divide up to ThHTU ÷ U using short division; interpret remainders appropriately for the context Multiply/divide by 10, 100, 1000			
	NC Y6	Perform mental calculations, including with mixed operations and large numbers Solve multi-step addition/subtraction problems in context, choosing operations and methods Perform mental calculations, including with mixed operations and large numbers Multiply up to ThHTU x TU using long multiplication Divide up to ThHTU ÷ TU Interpret remainders appropriately according to the context Divide where the answer has up to 2dp			
	Y7	Understand equality represented by numerical equations e.g. $5 + 6 = 8 + 3$ Find fact families for numerical bar models Understand/recognise the commutative and associative properties relating to the four operations Use a range of mental strategies to add/subtract/multiply/divide integers e.g. 43×9 Add and subtract integers up to a million using column methods; use this to solve 1-step equations Decide whether a written, mental or calculator method would be best for a given calculation Multiply and divide integers by 10, 100 or 1000 Multiply integers up to HTU x TU using long multiplication Divide by U or TU with an integer or simple terminating decimal answer Split division into multiple steps e.g. ÷24 using ÷6 then ÷4 Use factors to simplify multiplication e.g. 16x20=16x2x10 Use a number fact to derive others e.g. 23x21 given 23x42			Understand and use the terms odd, even Use non-calculator methods to calculate the sum, difference, product and quotient of positive and negative whole numbers
	Y8	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y9	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y10	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y11	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
USE OF A CALCULATOR	NC Y5				
	NC Y6				
	Y7	Use a calculator, where appropriate, in FDP conversion Use a calculator with directed numbers and decimals Use a calculator to convert between mixed numbers and improper fractions Use the FACT function on a scientific calculator to check a prime factorisation	Use a calculator and other technologies to calculate results accurately and then interpret them appropriately		
	Y8	Use a calculator to calculate percentages, and the result of a percentage change Use a calculator to convert more complex fractions to decimals e.g. 38/50 Use the memory on a calculator (in the context of standard form calculations) Enter standard form numbers into a calculator and display answers in standard form Use the π button			
	Y9	Use a calculator to evaluate numerical expressions involving powers and roots Use standard form on a scientific calculator			
	Y10	Use the sin, cos and tan functions on a scientific calculator			
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
ORDER OF OPERATIONS	NC Y5				
	NC Y6	Use order of operations with 4 operations and brackets			
	Y7	Extend the order of operations to squaring and negative numbers	Use conventional notation for the priority of operations, including brackets		Know the conventional order for performing calculations involving brackets and four rules
	Y8	Extend the order of operations to reciprocals e.g. $\frac{15+6}{15-8}$	Use conventional notation for the priority of operations, including reciprocals		Know the conventional order for performing calculations involving reciprocals
	Y9	Extend the order of operations to powers and roots	Use conventional notation for the priority of operations, including powers and roots		Know the conventional order for performing calculations involving powers and roots
	Y10				
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
NEGATIVE NUMBERS	NC Y5	Count forwards/backwards through 0			
	NC Y6	Use negative numbers in context Calculate intervals across 0			
	Y7	Represent/interpret negative numbers visually, including on a number line, height diagram, or as coloured counters Compare and order directed numbers Perform calculations that cross zero, including in context Explore/use the patterns for adding or subtracting a negative number e.g. -25 + -13, 17 – -8 Multiply and divide directed numbers e.g. -34 x -17	Use the four operations applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative [*cf. 'Fractions' & 'Decimals'*]		Use non-calculator methods to calculate the sum, difference, product and quotient of positive and negative whole numbers, fractions, mixed numbers and decimals [*cf. 'Fractions', 'Decimals'*]
	Y8	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y9	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y10	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
DECIMALS	NC Y5	Multiply/divide decimals by 10, 100 or 1000 Round decimals with 2dp to the nearest integer or 1dp Read/write/order/compare decimals with up to 3 dp			
	NC Y6	Multiply/divide decimals by 10, 100, 1000 with answers to 3dp Multiply 2 dp decimals by whole numbers Divide where the answer has up to 2dp Identify the value of each digit to 3dp			
	Y7	Understand/use place value in decimals with up to 3dp Position decimals on a number line Order decimal numbers given in words or figures Add/subtract decimals up to 2dp using column methods Solve financial problems including profit, loss, total cost, change, banks statements and utility bills Multiply and divide decimals by 10, 100 or 1000 Multiply integers and decimals by 0.1 and 0.01 (**H**) Multiply a decimal by an integer and multiply two decimals using integer multiplication up to HTU x TU Divide a decimal by an integer, including with simple terminating decimal answers Add/subtract combinations of fractions and decimals Use mental strategies with decimals e.g. $2.3 + 2.4$ Use a given fact to derive another e.g. 2.3 x 4.2 from 23 x 42 Solve problems involving quantities greater than 1 (**H**)	Use addition and subtraction applied to positive and negative decimals		Understand and use place value in decimals Add and subtract decimals, including negative decimals, without a calculator
	Y8	REVISE multiplying a decimal by an integer and multiplying two decimals, mentally and using a calculator Calculate with money (including with sharing in a ratio, percentage and estimation)	Use multiplication applied to positive and negative decimals		Multiply decimals, including negative decimals, without a calculator
	Y9	Know the correct notation for recurring decimals Divide an integer/decimal by an integer where the result is a recurring decimal Divide a decimal by a decimal by transforming to division by an integer Understand the equivalence of e.g. $0.24\dot{9}$ and 0.25	Use division applied to positive and negative decimals		Divide a decimal by a whole number, including negative decimals, without a calculator Without a calculator, divide a decimal by a decimal
	Y10	Solve complex problems combining understanding of fractions, percentages and/or ratio			
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
FRACTIONS	NC Y5	Compare/order fractions whose denominators are all multiples of the same number Identify equivalent fractions, represented visually, including tenths and hundredths Convert between mixed numbers and improper fractions Add/subtract fractions with the same denominator or where denominators are multiples of the same number, including answers greater than 1 Multiply proper fractions & mixed numbers by integers, supported by materials and diagrams Relate thousandths to tenths and hundredths			
	NC Y6	Add/subtract fractions with different denominators & mixed numbers, using equivalent fractions Multiply pairs of simple fractions Associate a fraction with division Simplify fractions using common factors			
	Y7	Represent/interpret fractions represented diagrammatically in a variety of forms and on number lines Use a hundred square to recognise equivalences between quarters, fifths, tenths and hundredths Shade a diagram to represent a fraction, including where the sections are irregular shapes; understand that such a diagram needs to consist of *equal* sections Represent tenths, hundredths, fifths and quarters on number lines Identify/use/find equivalent fractions, including on diagrams Solve increasingly difficult problems by calculating fractions of amounts; understand fractions as division; use mental strategies with fractions of amounts Find the whole, given a fraction of it Find fractions of amounts where the fraction is greater than 1 (**H**) Convert between improper fractions and mixed numbers, with and without a calculator; understand mixed numbers represented in diagrams Add/subtract fractions with the same and different denominators Add/subtract a fraction to/from an integer Add/subtract with mixed numbers and with combinations of fractions and decimals Use fractions in simple algebraic contexts Solve problems involving quantities greater than 1 (**H**)	Use the four operations applied to proper and improper fractions, and mixed numbers, all both positive and negative Interpret fractions as operators	Calculate exactly with fractions	Recognise and use equivalence between simple fractions and mixed numbers Calculate a fraction of a quantity Add and subtract simple fractions (proper and improper), including mixed numbers and negative fractions Calculate with fractions greater than 1
	Y8	Express one quantity as a fraction of another Multiply an integer/fraction by a fraction Divide an integer/fraction by a fraction Multiply/divide with improper fractions/mixed numbers (**H**) Know/understand the term reciprocal REVISE calculating fractions of amounts mentally and using a calculator	Express one quantity as a fraction of another where the fraction is less than 1		Multiply and divide simple fractions (proper and improper), including mixed numbers and negative fractions Express one quantity as a fraction of another
	Y9	Simplify a fraction involving an unknown or π e.g. $\frac{35\pi}{15}$ Solve problems involving a fractional increase or decrease	Express one quantity as a fraction of another where the fraction is greater than 1		Use fractions in exact calculations without a calculator Carry out more complex calculations, including the use of improper fractions
	Y10	Calculate the original quantity, given the result of a fractional increase or decrease Solve complex problems combining understanding of fractions, percentages and/or ratio Solve problems involving a repeated fractional increase or decrease			
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
PERCENTAGE	NC Y5	Recognise percentage as 'number of parts per 100'			
	NC Y6	Calculate percentages of quantities Use percentages to compare quantities			
	Y7	Represent/interpret percentages on a hundred square Understand/use the fact that 100% is a whole Calculate simple percentages of quantities without a calculator, focusing on multiples of 5%, including over 100% Given a simple percentage, work out the whole quantity Calculate percentages of amounts over 100% (**H**)	Define percentage as 'number of parts per hundred' Interpret percentages as operators Work with percentages greater than 100%		Understand percentage is 'number of parts per hundred' Calculate a percentage of a quantity
	Y8	REVISE calculating percentages of quantities without a calculator, focusing on multiples of 5%, including over 100% Calculate percentages of quantities using a calculator e.g. 0.35 x 800 Express one quantity as a percentage of another, with and without a calculator Find the percentage of an increase, decrease, profit or loss Find the original amount before a percentage increase, including percentages greater than 100% (**H**) Solve more complex problems involving percentages (**H**)	Express one quantity as a percentage of another Interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively Compare two quantities using percentages		Express one quantity as a percentage of another, with or without a calculator
	Y9	REVISE finding the result of a percentage change using a multiplier, finding the original value, and identifying the percentage of a given increase or decrease Calculate the result of a repeated percentage change, including compound interest Compare investments earning simple interest with those earning compound interest		Set up, solve and interpret the answers in growth and decay problems, including compound interest	Calculate simple interest, including in financial contexts Increase or decrease a quantity by a simple percentage, including simple decimal or fractional multipliers; apply this to simple original value problems and simple interest Express percentage change as a decimal or fractional multiplier; apply this to percentage change problems (including original value problems)
	Y10	REVISE solving problems involving percentage change, including simple and compound interest, original value problems, profit and loss, and identifying the percentage of a given increase, decrease, profit or loss Determine the number of increases or decreases by a percentage needed to obtain or exceed a given value, showing sufficient calculations to justify the result			
	Y11	Solve problems involving growth and decay; understand and use exponential formulae such as $N = Ak^t$ and $P = A \times (1+i)^n$			

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
FDP CONVERSION	NC Y5	Read/write decimal numbers as fractions up to thousandths Write percentage as a fraction over 100 Write percentage as a decimal Solve problems using % and decimal equivalents of 1/2, 1/4, 1/5, 2/5, 4/5 and denominators which are multiples of 10 or 25			
	NC Y6	Calculate decimal equivalents to fractions Recall/use equivalences between simple fractions, decimals and percentages, including in different contexts			
	Y7	Compare fraction and decimal number lines Convert tenths and hundredths between decimals and fractions; continue sequences involving a mixture of decimals and simple fractions (tenths, hundredths); perform simple calculations involving a mixture of decimals and simple fractions (tenths, hundredths) Convert fifths and quarters between decimals and fractions Use a hundred square to recognise the equivalence between percentages, tenths and hundredths Convert between simple fractions, decimals and percentages: tenths, hundredths, quarters, fifths Convert between eighths and thousandths (**H**) Convert fluently between a range of fractions, terminating decimals and percentages Convert a fraction to a terminating or recurring decimal by division Know what is meant by a terminating or recurring decimal	Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8)	**Change fractions into their corresponding recurring decimals**	Express a simple fraction as a terminating decimal or vice versa, without a calculator Convert between fractions, decimals and percentages Use division to convert a simple fraction to a decimal **Convert an exact fraction to a recurring decimal**
	Y8	REVISE converting fluently between fractions, terminating decimals and percentages Convert between decimals and percentages greater than 100% Convert more complex fractions to decimals by division, using a calculator e.g. 58/80			
	Y9	REVISE calculating with combinations of fractions, terminating and recurring decimals and percentages Ordering combinations of fractions, decimals and percentages			
	Y10	Convert a recurring decimal to a fraction		**Change recurring decimals into their corresponding fractions**	**Convert a recurring decimal to an exact fraction**
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
MULTIPLES, FACTORS & PRIMES	NC Y5	Identify multiples & factors; find all the factor pairs of a number and common factors of two numbers Know/use vocabulary of prime/composite numbers Recall prime numbers up to 19 and establish whether a number to 100 is prime			
	NC Y6	Identify common factors, common multiples and prime numbers			
	Y7	Work out the factors of a small number Identify common factors and the HCF of two small numbers Relate factors to an array diagram List the first few multiples, and identify larger multiples, of a small number Identify common multiples and the LCM of two small numbers Justify statements involving multiples and factors Know that a prime number is a positive integer with exactly two factors; identify small primes; know that 1 is not prime Express a number as a product of primes using a factor tree, recognising that this representation is unique Use the FACT function on a scientific calculator to check a prime factorisation Use a Venn diagram to find the HCF/LCM of two larger integers (**H**)	Use the concepts and vocabulary of prime numbers, factors, multiples, common factors, common multiples, highest common factor, and lowest common multiple Use prime factorisation, including using product notation and the unique factorisation property		Understand and use the terms prime, factor (divisor), multiple, common factor (divisor), common multiple Identify prime numbers less than 20 Express a whole number as a product of its prime factors e.g. 24 = 2 x 2 x 2 x 3 Understand that each number can be expressed as a product of prime factors in only one way Find the HCF and LCM of two whole numbers by listing Identify prime numbers Use power notation in expressing a whole number as a product of its prime factors
	Y8				
	Y9				
	Y10	REVISE writing a number as a product of its prime factors and finding the HCF/LCM of two numbers Solve problems using HCF or LCM Solve problems where numbers are given in prime factor form REVISE using the FACT function on a scientific calculator			Find the HCF and LCM of two whole numbers from their prime factorisations
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
POWERS & ROOTS	NC Y5	Recognise/use square and cube numbers, knowing the notation ^{2} and ^{3}			
	NC Y6				
	Y7	Understand/use square and higher powers, and square root Find the integers a square root lies between e.g. $\sqrt{45}$ Investigate the sequence of square numbers Investigate positive and negative powers of 10 (**H**) Convert between ordinary numbers and standard form (**H**) Add/subtract numbers in standard form without a calculator (**H**) Understand positive numbers have two square roots (**H**) Explore higher powers and roots (**H**)	Use integer powers (square, cube and higher) Use square root Recognise powers of 2, 3, 4, 5 Distinguish between exact representations of roots and their decimal approximations	Calculate with square roots, and with integer indices	Understand and use the terms square, cube, root Recognise simple powers of 2, 3, 4 and 5 e.g. $27=3^3$ Use positive integer indices e.g. to write 2x2x2x2 as 2^4 Calculate positive integer powers and square roots
	Y8	Apply the index laws for multiplication and division with numerical bases Understand the effect of raising a number to power 0 Use the index law for powers (brackets) (**H**) Understand positive and negative powers of 10 REVISE converting between standard form and ordinary numbers Order numbers in standard form Perform simple mental calculations involving numbers in standard form e.g. 2 x (3 x 10^7) REVISE adding/subtracting numbers in standard form without a calculator Correct a number written badly in standard form e.g. 17 x 10^4 Multiply/divide numbers written in standard form Calculate in standard form using a calculator Understand and use negative and fractional indices (**H**)	Use real roots associated with integer powers (square, cube and higher) Interpret and compare numbers in standard form A x 10^n $1 \leq A < 10$, where n is a positive or negative integer or zero	Calculate with roots Calculate with numbers in standard form	Calculate exact roots Interpret and order numbers expressed in standard form Convert numbers to and from standard form Use a calculator to perform calculations with numbers in standard form Add, subtract, multiply and divide numbers in standard form, without a calculator Know and apply the index laws for multiplication and division
	Y9	REVISE using the laws of indices for multiplication, division, and power 0 Apply the index law for powers of powers (brackets) Evaluate powers of -1 and other negative powers [*cf. Year 8*] Evaluate more complex expressions and solve problems using positive and negative powers e.g. evaluate $5^{-2} + 2^3$ Use a calculator to evaluate numerical expressions involving powers and roots			Calculate with negative integer powers Use negative integer indices to represent reciprocals Know and apply the index law for power of a power (brackets) Calculate with roots
	Y10	Estimate squares, cubes, square roots and cube roots Evaluate/use fractional powers (extending Y8 work) Know the definition of a surd and a rational/irrational number Understand/use multiplication of simple surds e.g. $\sqrt{5} \times \sqrt{7}$ Understand/use division of simple surds e.g. $\frac{2\sqrt{50}}{\sqrt{10}}$ *(not rationalising yet)* Simplify a surd e.g. $3\sqrt{50} = 3 \times \sqrt{25}\sqrt{2} = 15\sqrt{2}$ Add and subtract simple expressions involving surds e.g. $5\sqrt{3} + 2\sqrt{3} - \sqrt{3}$ Expand a single or double bracket involving surds Rationalise a single-term denominator in a surd expression Apply previous work on standard form, calculator and non-calculator, to GCSE-style problems		**Estimate powers and roots of any given positive number** **Calculate with fractional indices** **Calculate exactly surds** **Simplify surd expressions involving squares e.g. $\sqrt{12}$** **Rationalise denominators of surds**	**Use fractional indices to represent roots and combinations of powers and roots** **Calculate fractional powers** **Estimate powers and roots e.g. $\sqrt{51}$ to the nearest whole number** **Use surds in exact calculations without a calculator** **Simplify expressions with surds, including rationalising denominators**
	Y11	Factorise into a single bracket where the expression involves surds Rationalise a 2-term denominator in a surd expression Simplify complex surd expressions by combining skills Change the base of a power e.g. express 8^7 as a power of 2			

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
RATIO	NC Y5				
	NC Y6				
	Y7				
	Y8	Understand ratio, linking this to pictorial representations Use ratio notation, and solve simple problems using ratio Divide a value into a given 2-part or 3-part ratio Simplify a ratio, including with decimals or fractions Understand how ratios relate to fractions Understand 1:π as the ratio of d:C for a circle Know/use the fact that corresponding lengths in similar shapes are in the same ratio Link enlargement scale factor to a ratio of the form 1:n Express ratios in the form 1:n (H) Understand the gradient of a line as a ratio (H)	Use ratio notation Reduce a ratio to its simplest form Divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction		Find the ratio of quantities in the form a : b and simplify Split a quantity into two parts given the ratio of the parts Express the division of a quantity into two parts as a ratio# Understand the relationship between gradient and ratio Find the ratio of quantities in the form 1 : n Split a quantity into three or more parts given the ratio of the parts
	Y9	REVISE dividing a value into a 2-part of 3-part ratio Use a ratio and one part to find other part(s) or the whole Solve simple problems given a ratio and a difference e.g. Tom has 10 more marbles than Ella Solve problems combining understanding of fractions and ratio Solve simple problems involving combined ratios e.g. given the ratios A:B & A:C find the ratio B:C or A:B:C	Relate the language of ratios and the associated calculations to the arithmetic of fractions	Identify and work with fractions in ratio problems	Interpret a ratio of two parts as a fraction of a whole Calculate one quantity from another, given the ratio of the two quantities
	Y10	Solve more complex ratio problems e.g. comparison, mixing, concentrations Solve more complex problems involving the combining of ratios e.g. “10 more green are added, the ratio is now…” Solve complex problems combining understanding of fractions, percentages and/or ratio REVISE expressing ratios in the form 1:n Use ratios in the form 1:n to compare proportions Relate ratios to formulae e.g. 2y=3x, what is x:y?	Relate the language of ratios and the associated calculations to linear functions		Understand the relationship between ratio and linear functions
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
GROWTH & DECAY	NC Y5				
	NC Y6				
	Y7				
	Y8	Find the percentage of an increase, decrease, profit or loss Find the original amount before a percentage increase, including percentages greater than 100% (**H**) Solve more complex problems involving percentages (**H**)			
	Y9	REVISE finding the result of a percentage change using a multiplier, finding the original value, and identifying the percentage of a given increase or decrease Calculate the result of a repeated percentage change, including compound interest Compare investments earning simple interest with those earning compound interest Solve problems involving a fractional increase or decrease Calculate the original quantity, given the result of a fractional increase or decrease		Set up, solve and interpret the answers in growth and decay problems, including compound interest	Calculate simple interest, including in financial contexts Solve problems step-by-step involving multipliers over a given interval, for example compound interest, depreciation, etc.
	Y10	REVISE solving problems involving percentage change, including simple and compound interest, original value problems, profit and loss, and identifying the percentage of a given increase, decrease, profit or loss Determine the number of increases or decreases by a percentage needed to obtain or exceed a given value, showing sufficient calculations to justify the result Find the result of a repeated fractional increase or decrease Identify the overall fraction or percentage of a repeated fractional change			
	Y11	Solve problems involving growth and decay Understand and use exponential formulae such as $N = Ak^t$ and $P = A \times (1+i)^n$			**Express exponential growth or decay as a formula** **Solve and interpret answers in growth and decay problems**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
PROPORTION, SCALING & ENLARGEMENT	NC Y5	Solve problems involving scaling by simple fractions Solve problems involving simple rates			
	NC Y6	Solve problems involving the relative sizes of two quantities where missing values can be found using times tables			
	Y7	Interpret pie charts using understanding of proportion, where the chart is divided into equal portions or the angles are given			
	Y8	Solve simple direct proportion problems e.g. recipes Explore/use graphs direct proportion (H) Understand scale factors for lengths in enlarged shapes, linking this to a ratio of the form $1:n$ Enlarge a shape by a positive integer scale factor on a grid Draw/interpret scale diagrams Interpret map scale factors given as ratios or otherwise e.g. 1cm on the map is 4km in real life	Use scale factors, scale diagrams and maps Interpret scale drawings Draw and measure angles in geometric figures, including interpreting scale drawings	Recognise and interpret graphs that illustrate direct proportion	Construct and interpret scale drawings Use the scale of a map Enlarge a simple shape from a given centre using a whole number scale factor, and identify the scale factor of an enlargement Recognise and interpret graphs that illustrate direct proportion
	Y9	Understand a relationship between two quantities which are in direct proportion Know the features of expressions, tables, graphs or formulae, that represent a direct or inverse proportion Construct and use simple formulae describing direct and inverse proportion e.g. $a = kb$ (no powers or roots yet) Understand the relationship between two quantities that are inversely proportional; know that 'y is inversely proportional to x' is equivalent to $y \propto 1/x$ Enlarge a shape using a positive integer scale factor and centre of enlargement Enlarge a shape using a fractional scale factor and centre Identify the scale factor and centre of an enlargement, including where the scale factor is a fraction	Solve problems involving direct and inverse proportion, including graphical and algebraic representations	Understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y Interpret equations that describe direct and inverse proportion Recognise and interpret graphs that illustrate inverse proportion Interpret and use fractional scale factors for enlargements	Solve more formal problems involving quantities in inverse proportion Recognise that if y=k/x then y is inversely proportional to x Recognise and interpret graphs that illustrate inverse proportion Identify the centre and scale factor (including fractional scale factors) of an enlargement of a simple shape, and perform such an enlargement on a simple shape
	Y10	Enlarge a shape using a negative scale factor and a centre of enlargement Identify the scale factor and centre of an enlargement with a negative scale factor Solve problems involving similarity, linked to enlargement Understand the implications of enlargement on area and volume; move freely between scale factors for length, area and volume REVISE recognising graphs and tables that illustrate direct or inverse proportion Construct/use more complex formulae describing direct or inverse proportion, involving a power/root e.g. $A \propto 1/\sqrt{x}$		**Construct (and interpret) equations that describe direct and inverse proportion** **Interpret and use negative scale factors for enlargements**	**Formulate equations and solve problems involving a quantity in inverse proportion to a power or root of another quantity** **Perform and recognise enlargements with negative scale factors**
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
ALGEBRA VOCABULARY & NOTATION	NC Y5				
	NC Y6				
	Y7	Write expressions using algebraic notation e.g. $3a$ for $a + a + a$, p^2 for $p \times p$ Understand simple expressions with brackets Understand equality represented by numerical equations e.g. $5 + 6 = 8 + 3$ Use the ≡ symbol (in the context of like terms) Make/test conjectures in number, algebra and geometry; find counterexamples to disprove conjectures	Use and interpret algebraic notation, including ab, 3y, a^2, a^3, a^2b, a/b, brackets Understand and use the concepts and vocabulary of expressions, terms and equations		Understand and use the concepts and vocabulary of expressions, equations, and terms
	Y8	Distinguish between expressions, identities, equations and formulae	Understand and use the concepts and vocabulary of inequalities and factors	Know the difference between an equation and an identity	Understand and use the concepts and vocabulary of formulae, inequalities and factors Recognise the difference between an equation and an identity
	Y9	Understand powers of a bracket e.g. $(x + 3)^2$ REVISE using/interpreting more complex algebraic notation, including: a^2b in place of $a \times a \times b$, coefficients written as fractions rather than as decimals; practise through areas such as substitution	Write coefficients as fractions rather than as decimals		
	Y10				
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
MANIPULATING EXPRESSIONS	NC Y5				
	NC Y6				
	Y7	Use algebraic expressions with single and double function machines Identify the function(s) of a single or double function machine with algebraic inputs and outputs e.g. input y, output xy Recognise/sort like and unlike terms Identify simple equivalent expressions using all four operations e.g. $2m \times 3$ and $6m$ Add/subtract like and unlike terms using the ≡ symbol e.g. $2ab + 6ab - 3ab + 5a + 7$ Identify correct identities involving all four operations using the ≡ symbol Test the equivalence of expressions by substitution Use one fact to derive another e.g. find $2a + 2b$ given $a + b$ Multiply/divide algebraic terms e.g. $2a \times 6b$ (H) Add/subtract/multiply/divide simple algebraic fractions (H)	Simplify and manipulate algebraic expressions by collecting like terms		Simplify algebraic expressions by collecting like terms Simplify algebraic products and quotients
	Y8	Write an expression for the area or perimeter of a rectangle, parallelogram, triangle or circle where the lengths are given algebraically Add/subtract terms where manipulation of negative numbers is needed e.g. $-3p + 8 + 7p - 10$ Simplify by multiplying terms where coefficients are negative e.g. $3 \times -4p$ Add/subtract expressions involving different powers of the same unknown e.g. $5a^2 + 6a^2 + 2a^3$ Write non-integer coefficients as fractions rather than decimals Apply the index laws for multiplication and division with numerical and algebraic bases Multiply terms involving indices e.g. $2p \times 3q^2$ Divide terms involving indices e.g. $18a^2b \div 3a$ Understand the effect of raising an unknown or simple expression to power 0 e.g. $(15xy)^0$ Use the index law for powers (brackets) (H)	Simplify expressions involving sums, products and powers, including the laws of indices		Apply the index laws for multiplication and division to algebraic simplification, in simple cases
	Y9	Distinguish situations that can be modelled by an expression or a formula Create an expression to describe a situation Extend using the four operations with simple algebraic fractions to more complex expressions, including using the laws of indices [*cf. Year 7*] Manipulate expressions involving powers of -1 and other negative powers	Model situations or procedures by translating them into algebraic expressions	**Simplify algebraic fractions involving sums, products and powers, including using the laws of indices**	Formulate simple expressions from real-world contexts **Simplify algebraic products and quotients using the laws of indices** **Simplify and manipulate algebraic fractions** **Complete the square on a quadratic expression**
	Y10	REVISE the difference between an equation and an identity Create a mathematical argument to show that two expressions are equivalent (prove an identity) Simplify an algebraic fraction that involves factorisation (linear and quadratic expressions) Complete the square for a quadratic expression (x^2) [*see 'Co-ordinates & Graphs'*]		Use algebra to support and construct arguments Argue mathematically to show algebraic expressions are equivalent **Deduce the turning points of quadratic functions by completing the square** **Simplify and manipulate algebraic fractions by factorising quadratic expressions, including a difference of two squares**	Use algebra to construct arguments Show algebraic expressions are equivalent
	Y11	Complete the square for a more complex quadratic expression (ax^2) Use algebra in proofs including odd & even numbers, multiples, consecutive numbers etc.		**Use algebra to support and construct proofs**	**Use algebra to construct proofs and arguments**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
EXPANDING & FACTORISING	NC Y5				
	NC Y6				
	Y7	Find factors of a simple algebraic expression e.g. 6xy			
	Y8	Multiply out a single bracket e.g. $3(a+4)$, $2x(5-x+y)$ Factorise into a single bracket e.g. $6x+9y$, $a^2+ab+6a$ Expand a sum/difference of two single brackets Expand a single bracket and multiple single brackets involving indices e.g. $5pq(p+q)-2q^2(p+p^2)$ Expand a double bracket, including a perfect square (**H**)	Simplify and manipulate algebraic expressions by multiplying a single term over a bracket Simplify and manipulate algebraic expressions by taking out common factors		Simplify algebraic expressions by multiplying a single term over a bracket Take out common factors to form a single bracket Expand product of two binomials
	Y9	REVISE expanding a double bracket, including a perfect square e.g. $(x-3y)^2$ Expand a difference of two squares e.g. $(x+3)(x-3)$ or $(2x-5)(2x+5)$ Expand when more than two terms appear in a bracket e.g. $(x+3)(x^2+3x-5)$ Use brackets in simple contexts e.g. an expression for the area of a rectangle Factorise a quadratic expression of the form x^2+bx+c Factorise a difference of two squares of the form x^2-c			Factorise quadratic expressions of the form x^2+bx+c
	Y10	Expand the product of three binomials Factorise a quadratic expression of the form ax^2+bx+c Factorise a difference of two squares of the form ax^2-c Simplify an algebraic fraction that involves factorisation (linear and quadratic expressions)	Simplify and manipulate algebraic expressions by expanding products of two or more binomials	Simplify and manipulate algebraic expressions by factorising quadratic expressions of the form x^2+bx+c, including a difference of two squares **Factorise quadratic expressions of the form ax^2+bx+c** **Simplify and manipulate algebraic fractions by factorising quadratic expressions of the forms x^2+bx+c and ax^2+bx+c, including a difference of two squares**	**Expand products of more than two binomials** **Factorise quadratic expressions of the form ax^2+bx+c**
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
FUNCTIONS & MAPPINGS	NC Y5				
	NC Y6				
	Y7	Find inputs, outputs and functions for single and double function machines Use algebraic expressions with single and double function machines Identify the function(s) of a single or double function machine with algebra inputs and outputs e.g. input y, output xy	Interpret mathematical relationships both algebraically and graphically	Interpret simple expressions as functions with inputs and outputs	Interpret, where appropriate, simple expressions as functions with inputs and outputs
	Y8				
	Y9				
	Y10	Find numerical and algebraic outputs from functions defined using a function machine, expression or equation [*Note: $f(x)$ notation is not needed for OCR*]			
	Y11	Find an expression for the inverse of a given function by reversing a flow chart and rearrangement e.g. $y = x^2 - 3$; find the input for a given numerical or algebraic output Find numerical and algebraic input and output values for a composite function Given an algebraic input and output for a composite function, form and solve an equation [*Note: $f(x)$ notation is not needed for OCR*] Explore the effects of translations and reflections of a curve Sketch translations and reflections of a known curve e.g. sketch $y = sin(x + 45)$, $y = 3^{-x}$, $y = x^2 + 4$ Sketch translations and reflections of an unfamiliar curve from its graph, including where the graph has turning point(s) and asymptote(s) e.g. given $y = x^4 - 3x^2$ Label the co-ordinates of transformed points on the new sketch Given an original graph and its translation or reflection, identify the equation of the transformed graph e.g. $y = x^4 - 3x^2$ and a graph of $y = (x-5)^4 - 3(x-5)^2$		**Interpret the reverse process of a function as the 'inverse function'** **Interpret the succession of two functions as a 'composite function'** **Sketch translations and reflections of the graph of a given function**	**Interpret the reverse process of a function as the 'inverse function'** **Interpret the succession of two functions as a 'composite function'** **Identify and sketch translations and reflections of a given graph (or the graph of a given equation) e.g. y=sinx+2, $y=(x+2)^2-1$, $y=-x^2$** [*Knowledge of function notation not required for OCR*]

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
GRAPHS	NC Y5				
	NC Y6	Read/plot in all four quadrants			
	Y7	Plot a variety of graphs using graphing software Identify from an equation in terms of y whether a graph will be a straight line			
	Y8	Use/draw a conversion graph Read and plot co-ordinates in all four quadrants, including drawing own axes, labelling the 1st, 2nd, 3rd & 4th quadrants Identify/understand the equations of lines parallel to the axes Recognise/use the line $y = x$ Plot line graphs of the forms $y = kx, y = -kx, y = x \pm a, x + y = c, y = mx + c$ by completing tables of values Know/use the term origin Starting with ratio, find the gradient of a simple linear function from its graph Explore the gradients of lines of the form $y = kx$ (H) Plot non-linear graphs e.g. $y = x^2, y = 1/x$; identify non-linear functions from their equations (H) Find the midpoint of a line segment from a graph or a pair of co-ordinates (H)	Work with coordinates in all four quadrants Recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane Model situations or procedures using graphs Interpret mathematical relationships both algebraically and graphically		Work with x and y coordinates in all four quadrants Understand the relationship between gradient and ratio Construct and interpret graphs in real-world contexts e.g. distance-time, money conversion, temperature conversion Recognise and sketch the graphs of simple linear functions
	Y9	Identify and interpret gradients and intercepts of linear functions algebraically Use the form y = mx + c to identify parallel lines, including by rearranging equations Find the gradient and equation of a line from its graph Find the gradient of the line segment joining two given points Find the equation of a line through one point with a given gradient, through one point and parallel to another line, or through two given points Interpret the gradient of a straight line graph as a rate of change in context Interpret the y-intercept of a straight line graph in context Recognise/plot graphs of a range of quadratic functions; identify values of y for given values of x, and vice versa Sketch graphs of quadratic functions, using factorisation to identify roots Recognise that the gradient of a curve is not constant Estimate the gradient of a quadratic or other curve at a particular point, using a tangent Find approximate solutions to linear simultaneous equations using a graph Plot/sketch/recognise/interpret graphs of simple cubic functions, y=1/x and other simple reciprocal functions; identify values of y for given values of x, and vice versa	Recognise, sketch and produce graphs of quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane Reduce a given linear equation in two variables to the standard form y=mx+c Calculate and interpret gradients and intercepts of graphs of linear equations numerically, graphically and algebraically Use linear graphs to estimate values of y for given values of x and vice versa Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear graphs Use quadratic graphs to estimate values of y for given values of x and vice versa Use linear graphs to find approximate solutions of simultaneous linear equations	Use the form y=mx+c to identify parallel lines Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, and the reciprocal function y=1/x Find the equation of the line through two given points, or through one point with a given gradient Find approximate solutions to two linear simultaneous equations using a graph Interpret the gradient of a straight line graph as a rate of change	Use a table of values to plot graphs of linear and quadratic functions given as y in terms of x Find and interpret the gradient and intercept of straight lines, graphically and using y=mx+c Identify and find equations of parallel lines Construct and interpret graphs in real-world contexts e.g. distance-time, money conversion, temperature conversion Use a table of values to plot implicit linear functions e.g. 2x + 3y = 12 Use the form y=mx+c to find and sketch equations of straight lines Recognise and sketch the graphs of simple linear and quadratic functions e.g. x=1, y=2x, $y=x^2$ Interpret straight line gradients as rates of change e.g. gradient of a distance-time graph as a velocity Recognise and sketch the graphs of simple linear and quadratic functions Find the equation of a line through two given points, or through one point with a given gradient Use a table of values to plot cubic graphs, and reciprocals Use graphs to find the approximate solution of two linear simultaneous equations Use a graph to find the approximate solution of a linear equation Recognise and sketch graphs of $y=x^3$ and y=1/x [*Note: finding the midpoint or length of the line segment joining two pairs of co-ordinates is not explicitly included, although a scaffolded question could lead to these results*]

	Y10	Identify the gradient/equation of a line using a line which is perpendicular to it Show that lines are perpendicular using $m_1 \times m_2 = -1$ Calculate an estimate for the area under a curve; solve problems involving the area under graphs in context Interpret the gradient at a point on a curve as the instantaneous rate of change; interpret the gradient of a chord as an average rate of change; solve problems involving the gradients of graphs in context Understand and use a curved speed-time graph Find the instantaneous acceleration from a curved speed-time graph Find the average acceleration for a section of a speed-time graph Estimate the distance travelled from a curved speed-time graph Identify and interpret roots, intercepts and turning points of quadratic functions from their graphs Sketch a graph of a quadratic function (ax^2) by identifying roots algebraically Find approximate solutions to equations of the forms $ax^2 + bx + c = 0$ (roots) and $ax^2 + bx + c = k$ using a graph Find approximate solutions to equations of the form $ax^2 + bx + c = dx + e$ using the point of intersection of a line and a curve on a graph Identify the equation of a circle from its graph or from a description of its centre and radius/diameter Use the equation of a circle to sketch or describe its graph Find the equation of a tangent to a circle at a given point Use a completed-square form to identify the turning point (vertex), the minimum value and the value of x for which it occurs, the equation of the line of symmetry of the graph	Find approximate solutions to contextual problems from given graphs of a variety of functions, including exponential and reciprocal graphs	Plot and interpret graphs, including reciprocal graphs and graphs to non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration Identify and interpret roots, intercepts and turning points of quadratic functions graphically Find approximate solutions to a quadratic equation using a graph **Use the form $y = mx + c$ to identify perpendicular lines** **Deduce turning points of quadratic functions by completing the square** **Recognise and use the equation of a circle with the centre at the origin** **Find the equation of the tangent to a circle at a given point** **Calculate or estimate gradients of graphs and areas under graphs, including quadratic and other non-linear graphs** **Interpret the gradient of a graph, or area under a graph, in cases such as distance-time graphs, velocity-time graphs and financial graphs** **Interpret the gradient at a point on a curve as the instantaneous rate of change** **Apply the concepts of instantaneous and average rates of change (gradients of tangents and chords) in numerical, algebraic and graphical contexts**	Use graphs to find approximate roots of quadratic equations Identify intercepts and, using symmetry, the turning point of graphs of quadratic functions **Calculate or estimate gradients of graphs, and interpret in contexts such as distance-time graphs, velocity-time graphs and financial graphs** **Apply the concepts of average and instantaneous rate of change (gradients of chords or tangents) in numerical, algebraic and graphical contexts** **Calculate or estimate areas under graphs, and interpret in contexts such as distance-time graphs, velocity-time graphs and financial graphs** **Sketch graphs of quadratic functions, identifying the turning point by completing the square** **Identify and find equations of perpendicular lines** **Recognise and use the equation of a circle with centre at the origin** **Calculate the equation of a tangent to a circle at a given point**
	Y11	Use algebra to find the point(s) of intersection of a line and a quadratic curve, or a line and a circle Plot an exponential graph of the form $y=k^x$ ($k>0$) for positive and negative values of x, using a table of values Know the key features of an exponential graph of the form $y=k^x$ ($k>0$) Sketch exponential graphs, including two graphs on one set of axes, recognising how they differ e.g. $y=3^x$ and $y=5^x$ Solve problems in context involving sketching and interpreting exponential graphs Plot and interpret graphs of non-standard functions in real contexts Sketch the key features of the graphs of y = sin x, y = cos x and y = tan x, all for angles of any size REVISE estimating distance, instantaneous acceleration and average acceleration from a curved speed-time graph Find approximate solutions to simultaneous equations using a graph, where one is linear and one quadratic, or where one is linear and one is a circle		**Recognise, sketch and interpret graphs of the exponential function $y=k^x$ ($k>0$)** **Recognise, sketch and interpret graphs of y=sinx, y=cosx and y=tanx for angles in degrees of any size** **Find approximate solutions to simultaneous equations using a graph, where one is linear and one is quadratic**	**Use a table of values to plot exponential graphs** **Recognise and sketch graphs of exponential functions in the form $y = k^x$, $k>0$** **Recognise and sketch the graphs of y=sinx, y=cosx, y=tanx**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
FORMULAE & SUBSTITUTION	NC Y5				
	NC Y6	Use simple formulae			
	Y7	Substitute positive integers and decimals into one-step and two-step expressions e.g. n/3, 2(x+4) Substitute negative integers into expressions, including squaring Test the equivalence of expressions by substitution	Substitute numerical values into expressions		Substitute positive numbers into simple expressions
	Y8	REVISE earlier skills by practising in context – opportunities highlighted within scheme of work			
	Y9	Distinguish situations that can be modelled by an expression or a formula Create a formula to describe a situation Substitute positive and negative integers, decimals and fractions into formulae, including scientific formulae Change the subject of a formula involving two or more steps, including reciprocals	Substitute numerical values into formulae, including scientific formulae Rearrange formulae to change the subject Model situations or procedures by translating them into algebraic formulae		Substitute positive numbers into simple formulae to find the value of the subject Substitute positive or negative numbers into more complex formulae, including powers, roots and algebraic fractions Rearrange formulae to change the subject, where the subject appears once only Rearrange formulae to change the subject, including cases where a reciprocal of the subject appears Formulate simple formulae from real-world contexts
	Y10	Change the subject of a formula involving powers or roots Change the subject of a formula when the required subject appears twice			Rearrange formulae to change the subject in cases where the subject appears twice
	Y11	Use algebra in a range of context problems, such as volume, area or pressure, including proving results. (e.g. A cylinder with radius 2r & height h has the same volume as a sphere of radius 3r. Find a formula for h in terms of r.)			

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
SOLVING EQUATIONS	NC Y5				
	NC Y6	Express missing number problems algebraically Find pairs of numbers that satisfy an equation with two unknowns			
	Y7	Find fact families for algebraic bar models e.g. $x + 7 = 10$ Solve 1-step and 2-step equations involving integers and decimals where the unknown term is positive, using calculators where appropriate e.g. $2a + 4.7 = 9.3$ Solve simple 'think of a number' style questions by forming and solving an equation Solve equations involving number fractions e.g. $2k - \frac{5}{8} = 5$	Recognise and use relationships between operations including inverse operations Use algebraic methods to solve linear equations in one variable Interpret mathematical relationships both algebraically and graphically		
	Y8	Solve equations involving brackets Set up and solve an equation involving brackets Solve simple equations involving indices e.g. $3^x \times 3^x = 3^{10}$ Set up and solve equations involving angles			
	Y9	Solve a linear equation where the unknown term is negative e.g. $53 - 2x = 37$ Solve a linear equation with the unknown on both sides when the solution is an integer, fraction or negative or when the equation involves brackets Form and solve linear equations of the types listed above to solve problems e.g. perimeter, area, angles Solve quadratic equations of the form $x^2 + bx + c = 0$ by factorising Find the solution to a complex equation, to a required degree of accuracy, using 'trial and improvement' Find approximate solutions to simultaneous equations using a graph Solve two linear simultaneous equations algebraically Solve a problem by deriving two simultaneous equations, and interpret the solution	Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)		Solve linear equations in one unknown algebraically Set up and solve linear equations in mathematical and non-mathematical contexts, including those with the unknown on both sides of the equation Interpret solutions to equations in context **Find approximate solutions to equations using systematic sign-change methods (e.g. decimal search or interval bisection) when there is no simple analytical method of solving them [*Specific methods will not be requested in the assessment*]**
	Y10	REVISE solving problems in context by deriving and solving two linear simultaneous equations by elimination, including where one or both equations need to be multiplied Solve linear simultaneous equations with fraction/decimal coefficients Solve an equation involving algebraic fractions with numerical or algebraic denominators Find approximate solutions to equations of the forms $ax^2 + bx + c = 0$ (roots) and $ax^2 + bx + c = k$ using a graph Find approximate solutions to equations of the form $ax^2 + bx + c = dx + e$ using the point of intersection of a line and a curve on a graph REVISE solving quadratic of the form $x^2 + bx + c = 0$ by factorising Solve a quadratic of the form $ax^2 + bx + c = 0$ by factorising, including rearranging first; hence identify the roots and sketch a graph of the function Solve problems in context by forming and solving a quadratic equation Solve a quadratic equation (x^2 or ax^2) by completing the square Know and apply the Quadratic Formula Continue to solve a range of problems that generate a quadratic equation		Solve two linear simultaneous equations Deduce roots of quadratic functions algebraically Solve quadratic equations given in the form $x^2+bx+c=0$ by factorising **Solve quadratic equations, including those that require rearranging, by factorising** **Solve quadratic equations by completing the square** **Solve quadratic equations using the quadratic formula**	Find the roots of a quadratic equation algebraically Solve quadratic equations of the form x^2+bx+c by factorising Set up and solve two linear simultaneous equations in two variables algebraically **Recall and use the quadratic formula** **Solve linear equations involving algebraic fractions** **Rearrange and solve quadratic equations by factorising, completing the square or using the quadratic formula**

	Y11	Solve equations involving algebraic fractions with numerical and algebraic denominators, including where the equation can be rearranged to form a quadratic equation Show that a solution to a complex equation lies between two given values Understand the meaning of an iterative process; rearrange an equation to form an iteration formula Use an iterative formula to find approximate solutions to equations, including accurate to a given number of decimal places Find approximate solutions to simultaneous equations using a graph, where one is linear and one quadratic, or where one is linear and one is a circle Solve simultaneous equations in two variables algebraically using substitution, where one is linear and one is quadratic, or where one is linear and one is the equation of a circle Use algebra to find the point(s) of intersection of a line and a quadratic curve, or a line and a circle Solve other problems involving linear and quadratic simultaneous equations Solve equations involving algebraic fractions with algebraic denominators Solve simple trig. equations in the interval [0, 360°] using a graph and a calculator e.g. sin□x=0.7		**Solve two simultaneous equations where one is linear and one is quadratic** **Work with general iterative processes**	**Set up and solve two simultaneous equations (one linear and one quadratic) in two variables** **Know that the coordinates of the points of intersection of a curve and a straight line are the solutions to the simultaneous equations for the line and curve**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
INEQUALITIES	NC Y5				
	NC Y6				
	Y7		Use the symbols =, ≠, <, >, ≤, ≥ in numerical contexts		Understand and use the symbols <, ≤, > and ≥
	Y8	Use inequalities for groups in a frequency table, understanding e.g. $10 < x < 20$ and $10 \leq x \leq 20$ Solve a 1-step/2-step linear inequality with positive x term Step up and solve a 1-step/2-step linear inequality with positive x term			
	Y9	Extend solving a 1-step/2-step linear inequality with positive x term to inequalities involving brackets and with non-integer solutions Solve problems by constructing and solving linear inequalities in one variable Represent an inequality on a number line		Solve linear inequalities in one variable, representing the solution set on a number line	Solve linear inequalities in one variable, expressing solutions on a number line using the conventional notation
	Y10	Understand the situations in which a linear inequality is reversed Solve linear inequalities with unknowns on both sides and with negative terms of the unknown e.g $20 - 3x < 8$ Find the set of integers that are solutions to an inequality, expressing these using set notation e.g. { -1, 0, 1, 2, 3 } Solve a simple three-part inequality with positive x term e.g. $10 < 3x + 9 < 40$ Represent the solution of a linear inequality using set notation Draw line(s) and shade a region for multiple linear inequalities in two variables State the inequality/inequalities satisfied by a shaded region Find the set of integer coordinates that are solutions to a set of inequalities in two variables, including representing these using set notation Continue to solve problems by constructing and solving linear inequalities in one variable		**Solve linear inequalities in two variables, representing the solution set on a graph** **Represent the solution to an inequality using set notation**	**Solve (several) linear inequalities in two variables, representing the solution set on a graph** **Identify the solution sets of linear inequalities in two variables, using the convention of dashed and solid lines** **Express solutions to inequalities in set notation e.g. { x: x < 3 }**
	Y11	Solve a quadratic inequality (x^2 or ax^2), representing the solution set on a number line or using set notation		**Solve quadratic inequalities in one variable, representing the solution set on a number line**	**Solve quadratic inequalities in one variable**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
SEQUENCES	NC Y5				
	NC Y6	Generate/describe linear number sequences			
	Y7	Describe and continue sequences of patterns Predict and check next terms of patterns Work with sequences represented in a position-term table or graph Differentiate between linear and non-linear sequences, numerical and patterns Identify a linear (arithmetic), geometric, or Fibonacci-type sequence Continue linear and non-linear sequences Explain the term-to-term rule of a sequence Generate a sequence from a position-to-term rule e.g. n^2-4 Investigate the sequences of square and triangular numbers Find terms other than the next term in sequences (H)	Generate terms of a sequence from either a term-to-term or a position-to-term rule Recognise arithmetic sequences Recognise geometric sequences and appreciate other sequences that arise	Recognise and use the sequences of triangular and square numbers, and simple arithmetic progressions	Generate a sequence by spotting a pattern or using a term-to-term rule given algebraically or in words Recognise sequences of triangular and square numbers, and simple arithmetic progressions
	Y8	Explore different representations of a sequence: patterns, graph, table, equation, co-ordinates, function machine Generate a sequence from a written description of the first term and term-to-term rule Generate a sequence from a position-to-term rule, including more complex rules e.g. $(n+1)^2$ Investigate Fibonacci-type sequences Find the nth term of an ascending linear sequence, or sequence of patterns (H)		Deduce expressions to calculate the nth term of linear sequences	Generate a sequence from a formula for the nth term Find a formula for the nth term of an ascending arithmetic sequence
	Y9	REVISE generating terms of a sequence, including a quadratic sequence, from a position-to-term rule REVISE finding the nth term of an ascending linear sequence Find the nth term of a descending linear sequence Use the nth term of a sequence to decide whether a given number is in a sequence and to find a later term Justify a position to term rule in relation to a sequence of patterns e.g. why is the rule '$\times 2 \ +1$'? Recognise the sequence of cube numbers	Find the nth term of an arithmetic sequence	Recognise and use the sequence of cube numbers	Find a position-to-term rule for simple arithmetic sequences, algebraically or in words e.g. 2n, n + 5 Find a formula for the nth term of a descending arithmetic sequence Recognise the sequence of cube numbers
	Y10	Find the nth term of a quadratic sequence Recognise/use simple geometric sequences, r^n or ar^n, when r is positive and rational Recognise/use geometric sequences, ar^n, when r is a surd Find the next three terms, or a given term, in a geometric sequence Find a formula for the nth term of a simple geometric sequence Solve problems involving geometric sequences Find the nth term of a sequence of fractions Decide whether a sequence is linear, arithmetic, geometric, quadratic or none of these		Recognise and use quadratic sequences and simple geometric progressions (r^n where n is an integer and r is positive and rational) **Recognise and use geometric progressions of the form r^n where n is an integer and r is a surd** **Deduce expressions to calculate the nth term of quadratic sequences** **Recognise and use other sequences**	Recognise quadratic sequences, and simple geometric progressions (r^n where n is an integer and r is a positive rational number) **Find a formula for the nth term of a quadratic sequence** **Generate and find nth terms of other sequences,** including involving surds or fractions
	Y11	Work with Fibonacci-type sequences involving algebra and surds Use other recurrence relationships, including using subscript notation e.g. $u_{n+1} = 2u_n + 5$		Recognise and use Fibonacci type sequences	Recognise Fibonacci sequences **Use subscript notation for position-to-term and term-to-term rules**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
2D SHAPE & SYMMETRY	NC Y5	Distinguish between regular and irregular polygons using equal sides and angles			
	NC Y6	Draw shapes using given lengths & angles Classify shapes based on their properties and sizes Illustrate and name the parts of a circle, including radius, diameter, circumference Know that the diameter is twice the radius			
	Y7	Use capital letter notation for shapes, lines & angles Identify parallel and perpendicular lines, including within geometric figures Classify triangles: equilateral, isosceles, scalene, right-angled Classify quadrilaterals (square, rectangle, parallelogram, rhombus, kite, trapezium) using equal, parallel and perpendicular sides Identify polygons with up to 10 sides Distinguish regular and irregular polygons	Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric Use the standard conventions for labelling the sides and angles of triangle ABC		Use the terms points, lines, line segments, vertices, parallel lines, perpendicular lines Use the standard conventions for labelling and referring to the sides and angles of triangles Know the terms: regular polygon, scalene, isosceles and equilateral triangle, quadrilateral, square, rectangle, kite, rhombus, parallelogram, trapezium, pentagon, hexagon, octagon Draw diagrams from written descriptions as required by questions Know the basic properties of isosceles, equilateral and right-angled triangles; give geometrical reasons to justify these properties
	Y8	REVISE using capital letter notation for shapes, lines & angles Identify the side and angle properties of quadrilaterals (including parallel sides) Understand/use the properties of the diagonals of quadrilaterals (**H**) Know what is meant by an isosceles trapezium Identify lines of symmetry in 2D shapes Identify these parts of a circle: centre, radius, diameter, circumference	Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures (e.g. equal lengths and angles) using appropriate language and technologies	Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference	Understand and use the terms centre, radius, chord, diameter and circumference Know and apply the formula $C=2\pi r=\pi d$ to calculate the circumference of a circle Know the basic properties of the square, rectangle, parallelogram, trapezium, kite and rhombus; give geometrical reasons to justify these properties Identify reflection symmetries of triangles, quadrilaterals and other polygons
	Y9	Know/use Pythagoras' theorem to calculate any side in a right-angled triangle Know the meaning of a Pythagorean triple Use Pythagoras' theorem to determine whether a given triangle is right-angled Solve a range of 2D problems using Pythagoras' theorem Identify these parts of a circle: chord, tangent, arc, sector, segment Identify the order of rotational symmetry of a shape	Use Pythagoras' Theorem to solve problems involving right-angled triangles Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs Interpret mathematical relationships both algebraically and geometrically	Identify and apply circle definitions and properties, including: chord, tangent, arc, sector, segment Apply Pythagoras' Theorem in right-angled triangles in 2D	Identify rotation symmetries of triangles, quadrilaterals and other polygons Recall and use Pythagoras' theorem Know, derive and apply Pythagoras' theorem to find lengths in right-angled triangles in 2D figures Understand and use the terms tangent, arc, sector and segment
	Y10	REVISE solving problems using Pythagoras' theorem Use Pythagoras' theorem to find a length in a pyramid or cone, in the context of volume or surface area			
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
CONGRUENCE & SIMILARITY	NC Y5				
	NC Y6	Solve problems involving similar shapes where the scale factor is known or can be found			
	Y7				
	Y8	Know/use the fact that corresponding lengths in similar shapes are in the same ratio		Compare lengths using ratio notation and/or scale factors; make links to similarity Apply the concepts of congruence and similarity, including the relationship between lengths in similar figures Make links between similarity and scale factors or ratios	Identify similar triangles Compare lengths using ratio notation and scale factors
	Y9	Solve geometrical problems involving using similarity to calculate missing lengths Finding missing lengths in similar shapes when the scale factor is given as a ratio Prove that two triangles are similar using angles	Identify congruent triangles Know and use the criteria for congruence of triangles	Compare areas and volumes using ratio notation and/or scale factors; make links to similarity **Use the relationships between areas and volumes in similar figures**	Identify congruent triangles Compare areas and volumes using ratio notation and scale factors Apply similarity to calculate unknown lengths in similar figures Prove that two triangles are similar
	Y10	Solve more complex problems involving similarity, linked to enlargement e.g. one triangle within another, using algebra, forming and solving equations [*cf. Year 6, Year 8*] Know and use the conditions for triangles to be congruent (SSS, SAS, RHS, ASA) Prove that two triangles are congruent Move freely between scale factors for length, area and volume; solve practical problems involving length, area and volume in similar figures			Prove that two triangles are congruent using the cases SSS, ASA, SAS, RHS **Understand the relationship between lengths, areas and volumes of similar shapes**
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
ROTATIONS, REFLECTIONS, TRANSLATIONS & VECTORS	NC Y5	Identify/describe the position of a shape following a reflection or translation; know that the shape has not changed			
	NC Y6	Draw and translate simple shapes on the co-ordinate plane using word descriptions of movement Reflect shapes in the co-ordinate axes			
	Y7				
	Y8	Reflect in a vertical, horizontal or diagonal mirror line Reflect a shape in a mirror line specified by its equation e.g. $x = 3$, y-axis, $y = -x$	Construct congruent triangles, with and without coordinate grids		Use x- and y-coordinates in plane geometry problems, including transformations of simple shapes Reflect a simple shape in a given mirror line
	Y9	Rotate a shape through 90° or 180° on co-ordinate axes Translate a shape using a vector			Perform a specified translation using a column vector
	Y10	Identify/describe a single transformation, given two congruent 2D shapes Know that rotation, reflection and translation produce a congruent image, whereas enlargement produces a similar image Perform a sequence of two or more transformations on a 2D shape and fully describe the single transformation that would be the equivalent Identify points/lines that are invariant under a given transformation Understand that a vector quantity represents both magnitude (size) and direction, whereas a scalar quantity has only magnitude Draw a column vector as an 'arrow' on a grid, or write a column vector for a given 'arrow' Add and subtract column vectors, understanding this as a resultant of two vectors; multiply a column vector by a scalar Work with combinations of 'letter' vectors shown as arrows on a grid	Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures	Describe translations as 2D vectors Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors **Describe the changes and invariance achieved by combinations of rotations, reflections and translations**	Identify the mirror line of a reflection from a shape and its image Use a column vector to describe a translation Identify a mirror line x=a, y=b, y=x or y=-x from a simple shape and its image under reflection Identify the centre, angle and direction of a rotation from a simple shape and its image under rotation Understand addition, subtraction and scalar multiplication of vectors Represent a 2-dimensional vector as a column vector, and draw column vectors on a square or coordinate grid **Perform a sequence of isometric transformations (reflections, rotations or translations), on a simple shape; describe the resulting transformation and the changes and invariance achieved**
	Y11	Calculate vectors in a diagram e.g. in terms of a and b Calculate vectors in a diagram in problems involving a midpoint Calculate vectors in a diagram in problems where a side is divided in a ratio Understand why parallel vectors are multiples of one another; prove that two vectors within a given diagram are parallel Use the parallel properties of vectors to identify special quadrilaterals or to prove their existence Prove that three points in a given diagram are collinear		**Use vectors to construct geometric arguments and proofs**	**Use vectors in geometric arguments and proofs**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
PERIMETER, AREA & VOLUME	NC Y5	Measure/calculate the perimeter of rectilinear shapes in cm and m. Calculate the area of rectangles and rectilinear shapes, including using cm^2 and m^2 Estimate the area of irregular shapes using a grid Estimate volume and capacity			
	NC Y6	Recognise that shapes with the same area can have different perimeters & vice versa Calculate the area of parallelograms & triangles Calculate / estimate / compare the volume of cubes and cuboids using cm^3, m^3 and other units			
	Y7	Work out the perimeter of a simple shape; find a missing side given the perimeter Work out the perimeter of a rectilinear shape Calculate the area of a rectangle or parallelogram, understanding how the formulae for these are related Find a simple expression for the area of a rectangle or parallelogram e.g. Area = ab Calculate the area of a triangle, understanding the formula Calculate the area of a trapezium (**H**)	Calculate and solve problems involving: perimeters of 2-D shapes		Know and apply the formulae A=1/2bh for the area of a triangle and A=bh for the area of a rectangle Calculate the perimeter of rectilinear shapes
	Y8	Calculate the circumference of a circle, given the radius or diameter, including in terms of π Write an expression for the area or perimeter of a rectangle, parallelogram, triangle or circle where the lengths are given algebraically REVISE calculating the area of a rectangle, parallelogram or triangle Use the area of a rectangle, parallelogram or triangle to calculate a length or perpendicular height Calculate the area of a trapezium Calculate the area of compound shapes made from rectangles, parallelograms, triangles and/or trapezia Calculate the area of a circle, given the radius or diameter, including in terms of π Calculate the area of compound shapes involving circles and semicircles	Derive and apply formulae to calculate and solve problems involving the perimeter and area of triangles, parallelograms, and trapezia Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes	Calculate exactly with multiples of π	Recall and use formulae for the circumference and area of a circle Apply perimeter formulae in calculations involving the perimeter of composite 2D shapes Calculate the area of a trapezium Know and apply the formula $A=\pi r^2$ to calculate the area of a circle Apply area formulae in calculations involving the area of composite 2D shapes
	Y9	Calculate the perimeter of composite shapes that include sections of a circle, including in terms of π Calculate the area of more complex composite shapes that include sections of a circle, including in terms of π [*cf. Y8*] Solve problems involving the arc length, perimeter or area of a sector, including in terms of π Calculate the angle/radius of a sector using the arc length or area Calculate the volume of cuboids, right prisms and cylinders Know/use the link between volume and capacity Calculate the surface area of cuboids, right prisms and cylinders, including in terms of π Solve practical problems involving the volume and surface area of solids	Derive and apply formulae to calculate and solve problems involving the volume of cuboids (including cubes) and other prisms (including cylinders) Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, and cylinders to solve problems in 3D	Calculate arc lengths, angles and areas of sectors of circles	Use multiples of π in exact calculations without a calculator Calculate the area of a sector of a circle given its angle and radius Calculate the arc length of a sector of a circle given its angle and radius
	Y10	Find the volume of spheres, cones, frustums and pyramids, including in terms of π Find the surface area of spheres, cones and pyramids, including in terms of π Find the volume or surface area of a composite solid, including in the context of density and in terms of π Continue to solve practical problems involving the volume and surface area of solids	Use the properties of faces, surfaces, edges and vertices of pyramids, cones and spheres to solve problems in 3D	Calculate surface areas and volumes of spheres, pyramids, cones and composite solids	Calculate the surface area and volume of spheres, cones and simple composite solids (formulae will be given) Calculate the surface area and volume of a pyramid (the formula will be given)
	Y11	Know and use Area = ½ ab sin C to calculate the area, sides or angles in a triangle; recognise that Area = ½ bh is generally more appropriate for a right-angled triangle Calculate the area of a segment as the difference between the areas of a sector and triangle Use algebra in a range of context problems, such as volume, area or pressure, including proving results. (e.g. A cylinder with radius 2r & height h has the same volume as a sphere of radius 3r. Find a formula for h in terms of r.)		**Know and apply 1/2absinC to calculate the area sides or angles of a triangle**	**Know and apply the formula A=1/2absinC for the area of a triangle**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
ANGLES	NC Y5	Estimate/compare acute/obtuse/reflex angles Draw/measure angles in degrees Identify angles at a point and on a straight line Use the properties of rectangles to find missing lengths and angles			
	NC Y6	Find unknown angles in ~~any~~ triangles or quadrilaterals Find missing angles at a point, on a straight line, or where they are vertically opposite			
	Y7	Understand angles as a measure of turn Classify acute, obtuse, reflex and right angles Recognise interior and exterior angles of a polygon Measure/draw acute, obtuse and reflex angles Know/use the sum of angles at a point, on a line, in a triangle (including isosceles) and in a quadrilateral Recognise/use vertically opposite angles Apply combinations of angle rules to problems Find and use the angle sum of a polygon (**H**) Identify and use alternate, corresponding and co-interior angles near parallel lines; use the term transversal (**H**) Use known angle facts to obtain simple proofs (**H**)	Draw and measure angles in geometric figures Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles Understand and use the relationship between parallel lines and alternate and corresponding angles		Know the terms acute, obtuse, right and reflex angles Use a protractor to construct and measure angles Know and use the sum of the angles at a point is 360° Know that the sum of the angles at a point on a line is 180° Know and use vertically opposite angles are equal Know and use alternate angles or corresponding angles on parallel lines are equal
	Y8	REVISE classifying acute, obtuse, reflex and right angles REVISE solving problems using the sum of angles at a point, on a line, in a triangle (including isosceles), in a quadrilateral and using vertically opposite angles Identify and use alternate, corresponding and co-interior angles near parallel lines; use the term transversal Use the sum of the interior and exterior angles of polygons Know the definition of a regular polygon Find the interior and exterior angles in a regular polygon Prove geometric facts in simple cases (**H**)	Draw and measure angles in geometric figures, including interpreting scale drawings Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons		Derive and use the sum of the interior angles of a triangle is 180° Derive and use the sum of the exterior angles of a polygon is 360° Find the sum of the interior angles of a polygon Find the interior angle of a regular polygon
	Y9	Understand/use bearings Construct scale diagrams involving bearings Solve geometrical problems using bearings Use sin, cos, tan to find a missing side or angle in a right-angled triangle REVISE previously-met angle rules, including in polygons and near parallel lines Apply previously-met angle rules to forming and solving equations	Use trigonometric ratios in similar triangles to solve problems involving right-angled triangles	Interpret and use bearings Link trigonometric ratios to similar triangles Apply trigonometric ratios to find angles and lengths in right-angled triangles in 2D	

	Y10	Use basic trigonometry to solve problems in context, including angles of elevation and depression Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60°, 90° and tan θ for θ = 0°, 30°, 45°, 60° Use the Sine Rule and Cosine Rule to find missing sides and angles in non-right-angled triangles Know/apply the circle theorems; use the fact that the base angles of an isosceles triangle are equal Identify when a circle theorem can be used to help solve a geometrical problem Create a geometrical proof, including applying circle theorems		Know the exact values of sin θ and cos θ for θ=0, 30, 45, 60, 90°; know the exact value of tan θ for θ=0, 30, 45, 60° **Apply the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results** **Know and apply the sine rule and cosine rule to find unknown lengths and angles**	Recall and use the trigonometric identities for right-angled triangles Apply angle facts to find angles in rectilinear figures, and to justify results in simple proofs. e.g. 'The sum of the interior angles of a triangle is 180°' Use the basic properties of isosceles, equilateral and right-angled triangles to find lengths and angles in rectilinear figures and in simple proofs Use the properties of special triangles and quadrilaterals to find lengths and angles in rectilinear figures and in simple proofs Know and apply the trigonometric ratios, sin θ, cos θ and tan θ and apply them to find angles and lengths in right-angled triangles in 2D figures Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45° and 60° Apply congruent triangles in calculations and simple proofs. e.g. The base angles of an isosceles triangle are equal **Know and apply the sine rule and cosine rule to find lengths and angles** **Apply angle properties in more formal proofs of geometrical results** **Apply the standard circle theorems** [*see Spec. for details*]
	Y11	REVISE the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60°, 90° and tan θ for θ = 0°, 30°, 45°, 60° Use trigonometry to find the angle between a line and a plane, or between two planes; understand the terms 'plane' and 'line of greatest slope' Use trigonometry to solve a range of 3D problems in context Apply the Sine and Cosine rules to problems involving bearings Know and use Area = ½ ab sin C to calculate the area, sides or angles in a triangle; recognise that Area = ½ bh is generally more appropriate for a right-angled triangle Practise a range of GCSE-style problems combining SOHCAHTOA, the Sine Rule, the Cosine Rule, Pythagoras' theorem and ½ ab sin C Continue to create increasingly complex geometrical proofs, including applying circle theorems Prove circle theorems Practise a range of GCSE questions involving geometric proof with angles, expressing one angle algebraically in terms of another, setting up and solving an equation to determine a missing angle		**Prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results** **Apply trigonometric ratios to find angles and lengths in 3D** **Know and apply ½absinC to calculate the area sides or angles of a triangle**	**Recall and use 1/2absinC for the area of a triangle** **Use the basic properties of isosceles, equilateral and right-angled triangles in more formal proofs of geometrical results e.g. circle theorems** **Prove the standard circle theorems** [*see Spec. for details*] **Apply the trigonometry of right-angled triangles in more complex figures, including 3D figures**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
3D SOLIDS	NC Y5	Identify 3D shapes from 2D representations, including cubes and cuboids			
	NC Y6	Recognise/describe/build simple 3D solids Make nets of simple 3D solids			
	Y7				
	Y8				
	Y9	Recognise and know the properties of the cube, cuboid, prism, cylinder, pyramid, cone and sphere Construct a shape from its plan and elevations Construct the plan and elevations of a given shape		Construct and interpret plans and elevations of 3D shapes	Use the terms vertices, edges, planes Recognise the terms face, surface, edge, and vertex Recognise and know the properties of the cube, cuboid, prism, cylinder, pyramid, cone and sphere Interpret plans and elevations of simple 3D solids Construct plans and elevations of simple 3D solids, and representations (e.g. using isometric paper) of solids from plans and elevations
	Y10				
	Y11	Use Pythagoras' theorem in 3D to find the length of a given diagonal in a cuboid and use this to solve simple problems in context e.g. will the item fit in the box? Use Pythagoras' theorem to find the height of a pyramid from its slope length, or vice versa, given the dimensions of the base Use Pythagoras' to solve a range of 3D problems in context		**Apply Pythagoras' Theorem in 3D**	**Apply Pythagoras' theorem in more complex figures, including 3D figures**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
UNITS & TIME	NC Y5	Convert between metric units including distance, mass & capacity Understand/use approximate equivalences between metric and imperial units Solve problems involving measure using all four operations and decimal notation, including scaling Solve problems involving converting between units of time Interpret information from timetables			
	NC Y6	Solve problems involving calculating/converting units of measure, using decimals up to 3 dp Use/read/write/convert between standard units of length, mass, and time Use/read/write standard units of volume Convert between standard units of capacity Convert between miles and kilometres Use/read/write/convert between standard units of time			
	Y7	Use a table to find the distance between two places Convert between metric units of length, mass and capacity Understand the prefixes used for metric units e.g. milli	Use standard units of mass, length and money and other measures, including with decimal quantities Change freely between related standard units e.g. length, mass		Solve simple problems involving quantities in direct proportion, including currency conversion problems Use standard units of measurement for length, area, capacity, mass and money
	Y8	Convert between currencies using calculations, flow charts and graphs Convert between metric units of length, mass and capacity in more complex contexts e.g. to find area in m^2 Convert metric units of area and volume (**H**) Solve problems involving time and the calendar	Use standard units of time Change freely between related standard units e.g. time, length, area, volume/capacity, mass		Use and convert standard units of measurement for time Convert standard units of measurement for area, time and volume/capacity
	Y9	Solve problems involving speed, including more complex problems e.g. the average speed for a journey in two parts Convert between units of speed Solve simple problems involving density, including where the mass needs changing first to obtain specific units in the answer	Use compound units such as speed, unit pricing and density to solve problems	Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical contexts	Use and convert simple compound units (e.g. for speed) Know and apply in simple cases: speed = dist ÷ time Know and apply: density = mass ÷ volume Use and convert other compound units (e.g. density)
	Y10	REVISE solving complex problems involving speed and converting between units of speed Solve more complex problems involving density Solve problems involving pressure Use the volume of a composite solid in the context of density Solve problems involving rates of pay, population density and unit pricing Solve problems involving other rates of change		Convert between related compound units in numerical contexts	Use and convert simple compound units (e.g. for rates of pay, unit pricing) Use and convert other compound units (e.g. pressure)
	Y11	Use algebra in a range of context problems, such as volume, area or pressure, including proving results. (e.g. A cylinder with radius 2r & height h has the same volume as a sphere of radius 3r. Find a formula for h in terms of r.) Use compound units in algebraic contexts Understand the meanings of the unknowns in the kinematics formulae; know that these formulae apply in situations where acceleration is constant Select a suitable formula from the three given and substitute to solve a simple problem given in context Solve a quadratic equation resulting from a kinematics formula and interpret the result		Convert between related compound units in algebraic contexts	Use the kinematics formulae $v=u+at$, $s=ut+1/2at^2$, $v^2=u^2+2as$ Use and convert standard units in algebraic contexts Use and convert compound units in algebraic contexts

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
CONSTRUCTION & LOCI	NC Y5				
	NC Y6				
	Y7	Draw and measure line segments Measure objects using appropriate units Construct triangles using SAS, ASA, SSS, including from written descriptions Construct more complex shapes/pictures involving multiple polygons	Draw and measure line segments in geometric figures		Use a ruler to construct and measure straight lines Use a protractor to construct and measure angles
	Y8	REVISE constructing triangles using SAS, ASA, SSS, including from written descriptions REVISE constructing more complex shapes/pictures involving multiple polygons Measure/draw acute, obtuse and reflex angles Construct an angle bisector (H) Construct the perpendicular bisector of a line segment (H)	Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, bisecting a given angle)		Use compasses to construct circles Construct the perpendicular bisector and midpoint of a line segment Construct the bisector of an angle formed from two lines
	Y9	Construct the perpendicular from a point to a line, and the perpendicular from a point to a line Use construction to identify the shortest distance from a point to a line Construct the loci of points a fixed distance from a point, a fixed distance from a line, equidistant from two points, and equidistant from two lines Construct an angle of 60° and an angle of 30° Choose techniques to construct 2D shapes e.g. a rhombus	Derive and use the standard ruler and compass constructions (constructing a perpendicular to a given line from/at a given point) Recognise and use the perpendicular distance from a point to a line as the shortest distance to the line		Construct the perpendicular from a point to a line Construct the perpendicular to a line at a point Know that the perpendicular distance from a point to a line is the shortest distance to the line Understand the term ‘equidistant’
	Y10	Combine techniques to solve more complex loci problems, including shading regions satisfied by multiple ‘rules’			Apply ruler and compass constructions to construct figures and identify the loci of points, to include real-world problems
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
COLLECTING DATA	NC Y5				
	NC Y6				
	Y7				
	Y8	TBC: Understand and use primary and secondary sources of data TBC: Collect data, including using questionnaires			
	Y9				
	Y10	Understand the limitations of sampling Know what is meant by simple random sampling		Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling	Define the population in a study, and understand the difference between population and sample Understand what is meant by simple random sampling, and bias in sampling
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
USING STATISTICS	NC Y5				
	NC Y6	Calculate the mean of a simple set of discrete data and interpret it as an average			
	Y7	Find the range of a list of integers, including obtained by substitution or the result of calculations Find the median of a list of integers, understanding this as an average Calculate the mean for simple values or measurements, understanding this as an average Identify a missing value, given the mean, median or range			Calculate the mean, median and range for ungrouped data
	Y8	Identify qualitative, quantitative, discrete, continuous data Complete/interpret ungrouped frequency tables Calculate the total from an ungrouped frequency table Interpret a grouped frequency table Populate a grouped frequency table from a list of values or written 'facts' Use inequalities for groups in a frequency table TBC: Revisit the median and mean, including finding the total given the mean TBC: Find the mean from grouped data TBC: Work out the mode and modal class TBC: Choose the appropriate average TBC: Comparing distributions using measures TBC: Find unknown data values given the mean or changes in the mean (H) TBC: Find the median from a table of values (H)			Identify the mode for ungrouped data
	Y9	REVISE finding the modal class of set of grouped data REVISE estimating the mean of grouped data Estimate the range from a grouped frequency table Find the class interval containing the median for a set of grouped data Choose appropriate statistics to describe a set of data and to test statements Continue to interpret statistics in context, including comparing data	Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (including modal class) and spread (the range) Apply statistics to describe a population	Find the modal class, and calculate estimates of the range, mean and median for grouped data, and understand why they are estimates Make simple comparisons Compare data sets using 'like for like' summary values Understand the advantages and disadvantages of summary values
	Y10	Find the quartiles for discrete data sets, and understand the meaning of these Calculate and interpret the interquartile range Understand why the IQR is generally a more reliable measure of spread than the range Use a sample to infer properties of a population Use box plots to compare distributions Use a CF curve to estimate the median, quartiles and IQR Continue to choose appropriate statistics to describe a set of data and to test statements Continue to interpret statistics in context, including comparing data		Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling **Interpret, analyse and compare the distributions of data sets from univariate empirical distributions using quartiles and the inter-quartile range**	Describe a population using statistics Infer properties of populations or distributions from a sample **Calculate estimates of mean, median, mode, range, quartiles and interquartile range from graphical representation of grouped data** **Use the median and interquartile range to compare distributions**
	Y11				

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
TABLES, CHARTS & DIAGRAMS	NC Y5	Solve comparison, sum and difference problems using information presented in a line graph Interpret information in tables, including timetables			Design tables to classify data
	NC Y6	Construct/interpret simple pie charts and line graphs and use these to solve problems Construct/interpret pictograms for categorical data or discrete numerical data Construct bar charts for categorical data or discrete numerical data [*Bar charts and pictograms created as early as Year 3*]			
	Y7	Interpret simple pie charts showing quarters, fifths, tenths given as fractions, decimals or percentages Reading information from a table Complete/interpret a two-way table Complete/interpret a frequency tree Interpret bar charts and vertical line charts Plot a line graph for time series data Interpret pie charts using understanding of proportion, where the chart is divided into equal portions or the angles are given Construct a pie chart by calculating angles; find missing frequencies given the angle and total	Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data	Interpret and construct tables and line graphs for time series data	Interpret and construct charts appropriate to the data type; including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data Interpret and construct line graphs for time series data, and identify trends (e.g. seasonal variations)
	Y8	Draw a scatter graph and describe the relationship and type/strength of correlation shown Recognise data that can be represented using a scatter graph Draw a line of best fit and use it to make predictions, understanding that extrapolating can be unreliable; recognise graphs where a line of best fit would be inappropriate e.g. non-linear relationship Identify an outlier on a scatter graph Represent/interpret data in a two-way table TBC: Interpret and construct statistical diagrams, including multiple bar charts TBC: Construct and interpret pie charts (Assuming this includes measuring angles to interpret) TBC: Compare distributions using charts TBC: Identify misleading graphs TBC: Explore histograms for unequal groups (**H**) Construct a frequency polygon for grouped data (**H**)	Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs	Use and interpret scatter graphs of bivariate data Recognise correlation and know that it does not indicate causation Draw estimated lines of best fit on a scatter graph and use them to make predictions	Recognise graphical misrepresentation through incorrect scales, labels, etc. Plot and interpret scatter diagrams for bivariate data; recognise correlation Identify an outlier in simple cases e.g. from a list of data Interpret multiple and composite bar charts Interpret correlation within the context of the variables Draw a line of best fit by eye, and use it to make predictions Interpolate and extrapolate from data, and be aware of the limitations of these techniques Appreciate there may be errors in data from values (outliers) that do not ‘fit’ Recognise outliers on a scatter graph

	Y9	REVISE constructing pie charts by calculating angles, including with awkward totals Construct a pie chart using information from a different type of chart/diagram Recognise what can and cannot be deduced from a comparison of two pie charts Create a table and use it to group data, by tallying Construct/interpret bar charts for grouped data Construct/interpret stem and leaf diagrams; identify the mode, median and range from a stem and leaf diagram Use charts to identify probabilities Compare data given in more than one form	Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete, continuous and grouped data Construct and interpret appropriate tables, charts, and diagrams, including bar charts for grouped numerical data	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data	Design tables to classify data
	Y10	REVISE plotting points on a scatter diagram, identifying correlation and interpreting the relationship shown [*cf. Y8*] REVISE constructing/using a line of best fit [*cf. Y8*] Estimate a percentage using a scatter diagram e.g. 'What percentage passed both Maths and English?' Understand the lack of reliability of making predictions outside the range of the original data (extrapolating) REVISE outliers, distinguishing these from anomalies [*cf. Y8*] Understand that correlation does not necessarily indicate causation Construct and interpret a box plot for discrete data Construct a cumulative frequency curve Use a CF curve to estimate values, including percentages, and the median, quartiles and IQR Use a cumulative frequency curve to construct a box plot Use box plots to compare distributions Continue to use charts to identify probabilities Continue to compare data given in more than one form Construct a histogram, understanding why it is appropriate for groups of different widths [*cf. Year 8*]		Interpolate and extrapolate apparent trends from a scatter graph, whilst knowing the dangers of so doing **Construct and interpret diagrams for grouped discrete data and continuous data,** including **cumulative frequency graphs, and know their appropriate uses** **Interpret, analyse and compare the distributions of data sets from univariate empirical distributions using box plots**	Appreciate the distinction between correlation and causation **Interpret and construct diagrams for grouped data as appropriate,** including **cumulative frequency graphs**
	Y11	Use a histogram to find missing values in a frequency table; use a partially-completed histogram and table to complete both Identify a value from a histogram e.g. how many people earned over £12000; estimate a value from a histogram where the value is mid-bar Find or estimate the median and quartiles from a histogram Continue to use charts to identify probabilities Continue to compare data given in more than one form		**Construct and interpret diagrams for grouped discrete data and continuous data,** including **histograms with equal and unequal class intervals, and know their appropriate uses**	**Interpret and construct diagrams for grouped data as appropriate,** including **histograms (with either equal or unequal class intervals)** **Draw and interpret box plots**

		SCHEME OF WORK	NATIONAL CURRICULUM KS3	NATIONAL CURRICULUM KS4	OCR GCSE SPECIFICATION
PROBABILITY	NC Y5				
	NC Y6				
	Y7	Use a Venn diagram to sort information (e.g. factors) including using set notation and ξ Group numbers, shapes and other data using set notation Understand the notation ξ for the universal and its impact on the membership of subsets e.g. { even numbers } given ξ = { integers from 1 to 10 inclusive } Understand/use the terms likely, unlikely, even chance (evens), impossible, certain List a sample space, including using set notation Calculate a simple theoretical probability Create a situation to give a required theoretical probability e.g. label the sections on a spinner so that p(odd) = 4/5 Understand that the probabilities of all outcomes add to 1; use this to find missing probabilities e.g. in a table Construct/interpret frequency trees Understand and use the complement of a set (H)	Understand that the probabilities of all possible outcomes sum to 1 Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams	Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions	Use the 0-1 probability scale as a measure of likelihood of random events, e.g. 'impossible' with 0, 'evens' with 0.5, 'certain' with 1 Use systematic listing strategies Use a two-circle Venn diagram to enumerate sets, and use this to calculate related probabilities Use the addition law for mutually exclusive events Use p(A) + p(not A) = 1 Use simple set notation to describe simple sets of numbers or objects Use set notation to describe a set of numbers or objects e.g. D = {x : x is factor of 280} Use frequency tree diagrams to enumerate sets and to record the probabilities of successive events (tree frames may be given and in some cases will be partly completed)
	Y8	Represent/interpret data in a two-way table (no probability) Construct a sample space diagram and use it to identify theoretical probabilities Construct a two-way table or Venn diagram and use it to identify theoretical probabilities Use the product rule for counting in simple cases to find the total number of possible outcomes (H)	Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities		Calculate probabilities of simple combined events, for example rolling two dice and looking at the totals Use tables and grids to list the outcomes of single events and simple combinations of events, and to calculate theoretical probabilities e.g. Flipping two coins, finding the number of orders in which the letters E, F and G can be written Use sample spaces for more complex combinations of events e.g. outcomes for sum of two dice
	Y9	Identify the relative frequency of an event from experimental data Understand that increasing the sample size leads to outcomes that are closer to theoretical probability Understand that repeating an experiment may change the outcome Use theoretical or experimental probability to calculate expected outcomes	Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale	Use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size	Use relative frequency as an estimate of probability Calculate probabilities, expressed as fractions or decimals, in simple experiments with equally likely outcomes e.g. flipping coins, rolling dice Record, describe and analyse the relative frequency of outcomes of repeated experiments using tables and frequency trees Apply ideas of randomness and fairness in simple experiments Use probabilities to calculate the number of expected outcomes in repeated experiments Understand that relative frequencies approach the theoretical probability as the number of trials increases
	Y10	Extend applying the 'product rule for counting' to increasingly complex contexts [*cf. Year 8*] Know and apply the addition and multiplication laws of probability ('or' and 'and') Draw a tree diagram to show the outcomes of two or three combined events Label tree diagrams with probabilities for independent/dependent events Use a probability tree diagram to solve a range of problems involving dependent and independent combined events Extend using two-way tables for calculating theoretical probabilities to GCSE-style problems [*cf. Year 8]* Extend using Venn diagrams for calculating theoretical probabilities to GCSE-style problems, including where the intersection needs to be deduced [*cf. Year 8]*		**Use the product rule for counting**	Construct a Venn diagram to classify outcomes and calculate probabilities Use tree diagrams and other representations to calculate the probability of independent and dependent combined events **Use the product rule for counting numbers of outcomes of combined events**

	Y11	Practise a range of GCSE questions on probability, including conditional probability, deciding which methods to apply and diagrams to draw, including using tree diagrams, Venn diagrams, two-way tables and sample spaces Understand the formulae P(A or B) = P(A) + P(B) – P(A and B) and P(A and B) = P(A given B) x P(B)		**Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams**	Derive or informally understand and apply the formula p(A or B) = p(A) + p(B) - p(A and B) **Recognise when a sample space is the most appropriate form to use when solving a complex probability problem** **Use the most appropriate diagrams to solve unstructured questions where the route to the solution is less obvious** **Construct tree diagrams, two-way tables or Venn diagrams to solve more complex probability problems (including conditional probabilities; structure for diagrams may not be given)** **Understand the concept of conditional probability, and calculate it from first principles in known contexts e.g. In a random cut of a pack of 52 cards, calculate the probability of drawing a diamond, given a red card is drawn** **Derive or informally understand and apply the formula p(A and B) = p(A given B) x p(B)** **Know that events A and B are independent if and only if p(A given B) = p(A)**