Strand	Topic	Grade -1/ 1	Grade 1/ +1	Grade -2/ 2	Grade 2/ 2+	Grade -3/ 3	Grade 3/ 3+	Grade -4/ 4/ 4+	Grade -5/ 5/ 5+	Grade -6/ 6/ 6+	Grade -7/ 7/ 7+	Grade -8/ 8/ 8+	Grade -9/ 9/ 9+
Number	Accuracy and bounds	Round positive whole numbers to the nearest 10, 100 or 1000		Round decimals to the nearest whole number	Round numbers to significant figures		Identify upper and lower bounds for rounding of discrete and continuous data		Identify the upper and lower bounds of a measurement	Calculate the upper and lower bounds of 2D measurements involving addition e.g. perimeter	Calculate the upper and lower bounds of 2D measurements e.g. area	Calculate the upper and lower bounds of other compound measurements, e.g. density	
Number	Accuracy and bounds								Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction. Use error intervals	Use inequality notation to specify simple error intervals due to truncation or rounding	Calculate the upper and lower bounds of 2D measurements involving subtraction e.g. difference in length		
Number	Accuracy and bounds										Find upper and lower bounds of calculations that involve division		
Number	Calculations	Add three or more multiples of 10	Apply four operations in correct order to integers and proper fractions	Check a result by working it backwards	Add and subtract integers - positive and negative numbers	Add and subtract negative integers from positive and negative numbers	Simplify expressions containing powers to complete the calculation	Divide an integer by a fraction	Solve problems involving division of fractions and whole numbers	Solve more challenging problems involving the four operations with fractions including mixed numbers			
Number	Calculations	Add and subtract positive integers.	Choose and use an appropriate method to subtract whole numbers with up to 5 digits. Example: 45 000 – 2695, 36 628 – 1455, 54 839 – 28 405	Choose and use an appropriate mental or written method, including column addition and subtraction, to add and subtract decimal numbers with 1, 2 or 3 decimal places, including in the context of measures and money. Example: 63.25 + 3.75, 54.2 + 6.9, 7.03 + 16.25	Add and subtract positive integers from negative integers	Add and subtract simple fractions with denominators of any size	Divide integers and decimals, including by decimals such as 0.6 and 0.06 (divisions related to 0.t × 0.t or 0.t × 0.0h, 0.0h × 0.t and 0.0h × 0.0h)	Find the reciprocal of simple numbers/fractions mentally, e.g. 10 and 1/10, 1/3 and 3 etc.		Solve problems involving multiplication and/or division of fractions including mixed numbers			
Number	Calculations	Choose and use an appropriate method to add whole numbers with up to 5 digits. Example: 86 342 + 75 218, 34 608 + 2021, 23 509 + 48 253	Choose and use an appropriate method to subtract whole numbers with up to 7 digits. Example: 6 728 243 – 4 372 178, 23 000 – 5, 1 234 000 – 1999	Divide numbers up to 4 digits by numbers up to 12 using the formal written method of short division, where appropriate interpret remainders according to the context and use reasoning to find a solution. Example: 5278 ÷ 3, 4887 ÷ 6, 9246 ÷ 8	Add several decimal numbers using mental or written addition. Example: 6.39 + 2.14 + 8.7 + 23.4, 38.65 + 7.89 + 3.25, 7.5 + 3.9 + 2.8	Add and subtract up to three fractions, mixing both addition and subtraction into the calculation, with denominators less than or equal to 12 and using the LCM denominator in the calculation (the answer can be a mixed number)	Multiply and divide by decimals, by transforming to multiplication or division by an integer and then converting back	Know that a number multiplied by its reciprocal is 1					
Number	Calculations	Find a difference by counting up through the next multiple of 10	Choose and use an appropriate method, including column addition, to add whole numbers with up to 7 digits, and identify patterns in the number of steps required to generate palindromic numbers. Example: 2 347 256 + 1 238 584, 462 308 + 5090, 48 673 + 49 999	Extend written methods to HTU ÷ U	Add and subtract integers and decimals with varying numbers of decimal places	Add mixed number fractions without common denominators, where the fraction parts add up to more than 1	Multiply decimals by whole numbers by multiplying by 10 or 100 to make whole number calculations then dividing by 10 or 100 to find the answer Example: 23 × 46.2, 16 × 39.2, 24 × 5.26	Know that the reciprocal of a reciprocal is the original number					
Number	Calculations	Know by heart multiplication facts up to 10 × 10	Choose and use an appropriate method, including counting up, to add and subtract numbers with up to 2 decimal places, including in the context of measures and money and finding change, and use mathematical reasoning to investigate and solve problems. Example: 0.92 + 0.3, 16.53 – 9.87, 47.48 – 10.16	Extend written methods to TU × TU	Add and subtract more than two integers or decimals with up to two decimal places each, but with varying numbers of significant figures and using a mixture of operations within the calculation	Be able to divide any number by 0.1 and 0.01	Recognise and use relationships between operations, including inverse operations	Multiply both sides of an inequality by a negative number					
Number	Calculations	Partition to multiply mentally TU × U	Consolidate adding and subtracting numbers mentally with increasingly larger numbers. Example: 8429 + 34 966, 982 384 – 600 10	Identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to 3 decimal places; round decimal numbers to the nearest tenth and whole number. Example: Which is greater, 7.845 or 7.425? 0.73 > 0.694	Subtract integers and decimals with up to two decimal places each	Be able to estimate answers to calculations involving 2 or more operations and BODMAS	Understand that each of the headings to the right of the tens column in the place value system can be written as a power of ten	Solve problems involving addition and subtraction of fractions including mixed numbers					
Number	Calculations	Use doubling	Consolidate adding and subtracting whole numbers with more than 4 digits, including using column addition and subtraction. Example: 53 407 – 21 999, 39 264 + 51 703 + 9810, 13 872 – 11 219	Know and use the order of operations	Be able to work with calculations where numbers are squared within a bracket	Be able to multiply any number by 0.1 and 0.01	Understand which part of an expression is raised to a power by knowing the difference between $3 \times (7 + 8)^2$ and $3^2 \times (7 + 8)$ and $(3 \times (7 + 8))^2$	Understand the difference between squaring a negative number and subtracting a squared number within a more complex calculation					
Number	Calculations	Use halving	Extend written methods to HTU × U	Multiply 2-, 3-, and 4-digit numbers by numbers up to 12 using short multiplication or another appropriate formal written method and solve word problems involving multiplication of money and measures. Example: 3 × £15.48, 8365 × 8, 24.8 × 6	Begin to add and subtract simple fractions and those with simple common denominators	Be able to work with calculations where the brackets are squared or square rooted	Use knowledge of place value to calculate the product or division of two decimals where one or both are less than 1 and at least one has two digits other than zero.	Understand that each of the headings in the place value system, to the left of the units column, can be written as a power of ten					
Number	Calculations	Use standard column procedures to add and subtract whole numbers	Multiply and divide integers by 10 and 100, and explain the effect	Multiply and divide decimals by 10, 100, 1000, and explain the effect	Convert mixed numbers to improper fractions and improper fractions to mixed numbers	Divide decimals with one or two places by single-digit whole numbers	Use standard column procedures to add and subtract integers and decimals of any size, including a mixture of large and small numbers with different numbers of decimal places	Understand the order in which to calculate expressions that contain powers and brackets in both the numerator and denominator of a fraction					
Number	Calculations		Understand addition and subtraction as they apply to whole numbers and decimals	Multiply by 0	Divide numbers up to 4 digits by a 2-digit number using the formal written method of short division where appropriate, estimating answers and interpreting remainders according to the context, including money problems that require answers to be rounded. Example: 744 ÷ 6, 8838 ÷ 6, 1/8 of £86.40	Divide numbers up to 4 digits by a 2-digit whole number using the formal written method of long division, making an estimate using multiples of 10 or 100 of the divisor, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Example: 4936 ÷ 24, 1392 ÷ 32, 4560 ÷ 23	Write numbers as a decimal number of millions or thousands, e.g. 23 600 000 as 23.6 million	Use conventional notation for priority of operations, including roots and reciprocals					

Number	Calculations		Understand that halving is the reverse of doubling	Perform mental calculations, including with mixed operations and large numbers. Example: 3 × 26 – 15, *c* + 6 = 22. What is *c* ? 64 ÷ (4 + 4)	Divide 3-digit by 2-digit whole numbers	Divide numbers up to 4 digits by a 2-digit whole number using the formal written method of long division, making approximations, and interpret remainders as whole number remainders, fractions (simplifying where possible or writing the fractional part of the answer as a decimal where the equivalent is known) or by rounding as appropriate for the		Multiply decimals to one decimal place using formal written methods					
Number	Calculations			Quickly derive associated division facts	Extend written methods to U.t × U	Express a remainder after division as a fraction, simplifying where possible. Example: 3523 ÷ 6 = 587 r 1 = $587\ ^{1}/_{6}$ 3525 ÷ 6 = 587 r 3 = $587\ ^{3}/_{6}$ or $587\ ^{1}/_{2}$		Solving problems involving multiplication of fractions including mixed numbers					
Number	Calculations			Solve problems involving addition, subtraction, multiplication and division. Example: 3 × 26 – 15, (6.4 – 4.2) ÷ 2	Know all multiplication and division facts up to 12 × 12; identify common factors, common multiples and prime numbers. Example: What are the common factors of 54, 72 and 48? What is the lowest common multiple of 2, 4 and 52	Have strategies for calculating fractions and decimals of a given number							
Number	Calculations			Understand division as it applies to whole numbers and decimals	Know that the contents of brackets are evaluated first	Multiply 1- and 2-digit numbers with up to 2 decimal places by whole numbers. Example: 0.07 × 6, 4.26 × 3, £48.76 × 3							
Number	Calculations			Understand multiplication as it applies to whole numbers and decimals	Know the links between fractions and division	Multiply a fraction by an integer							
Number	Calculations			Use appropriate strategies to multiply and divide mentally, including by multiples of 10, 100 and 1000, and solve scaling problems and problems involving rate. Example: 3.45 × 10, 243 ÷ 1000, 86 × 5	Multiply and divide negative integers by a negative number	Multiply an integer by a fraction							
Number	Calculations			Use appropriate strategies to multiply and divide mentally, including by multiples of 10, 100 and 1000.	Multiply and divide negative integers by a positive number	Understand the effect of dividing by any integer power of 10							
Number	Calculations			Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy	Multiply decimals with one or two places by single-digit whole numbers	Understand the effect of multiplying by any integer power of 10							
Number	Calculations			Use knowledge of the order of operations to carry out calculations involving the four operations. Example: 3 × (117 – 95), 45 – *d* = 21. What is *d* ?	Multiply multi-digit numbers up to 4 digits by a 1- or 2-digit whole number using the formal written method of long multiplication. Example: 6742 × 23, 13 × 5278, 22 × 4327	Use a systematic approach to solve problems involving multiplication and division. Example: A playground is to be 1728 m^2. It needs to be rectangular in shape and one side must measure between 20 and 30 m. Each side must be a whole number of metres to make efficient use of the 1 m fence panels. Find the possible dimensions of the playground and then compare these to find the most							
Number	Calculations			Use knowledge of the order of operations to carry out calculations involving the four operations. Example: 3 × (117 – 95),12 × *k* = 96. What is *k* ?	Multiply multi-digit numbers up to 4 digits by a 2-digit whole number using the formal written method of long multiplication and solve problems involving multiplication of money and measures. Example: 23 ×	Use mental strategies for multiplication - doubling and halving strategies							
Number	Calculations			Use knowledge of the order of operations, including using brackets, to carry out calculations involving the four operations. Example: 3 × (117 – 95), (3 × 4) + 16	Multiply multi-digit numbers up to 4 digits by numbers between 10 and 40 using the formal written method of long multiplication. Example: 6537 × 12, 18 × 2035, 1748 × 39	Use mental strategies for multiplication - partitioning two 2 digit numbers where one number includes a decimal (both numbers have two significant figures)							
Number	Calculations			Use short division to divide 4-digit numbers by 1-digit numbers, including those which leave a remainder; spot patterns, make and test general rules, and check when an answer does not fit the predicted pattern. Example: 4532 ÷ 4, 6382 ÷ 7, 5247 ÷ 3, 4783 ÷ 5, Which will have an answer of less than 1000? Can you tell just by	Multiply 3-digit by 2-digit whole numbers	Use mental strategies for multiplication of decimals - doubling and halving strategies							

Number	Calculations			Use short multiplication to multiply numbers with up to 4 digits, including amounts of money, by 1-digit numbers and solve word problems involving multiplication including two-step problems and finding change. Example: 6 × £23.45, 2042 × 4, 5 × 1217	Perform mental calculations, including with mixed operations and large numbers, and use inverse operations to solve missing number problems. Example: 3 × 26 – 15, c + 6 = 22. What is c ?	Use mental strategies to multiply 2-digit numbers with one decimal place by 1-digit whole numbers. Example: 4.2 × 6, 4 × 6.8, 5 × 3.7							
Number	Calculations			Use standard column procedures to add and subtract decimals with up to two places	Perform mental calculations, including with mixed operations and large numbers, and use inverse operations to solve missing number problems. Example: 3 × 26 – 15, c + 6 = 22. What is c ? 64 ÷ (4 + 4)	Use written division methods in cases where the answer has up to 2 decimal places. Example: 1266 ÷ 8 = 158 r 2 = 158 $^{2}/_{8}$ or 158 $^{1}/_{4}$ = 158.25							
Number	Calculations				Solve addition and subtraction multi-step problems in contexts, including money, deciding which operations and methods to use and why. Example: 23.47 – 20.3, 6.39 + 2.14 + 8.7 + 23.4, £16.88 + £3.47	Solve multi-step problem solving questions involving value for money.							
Number	Calculations				Solve problems involving addition, subtraction, multiplication and division Example: 3 × 26 – 15, (28 – 15) + 9, (6.4 – 4.2) ÷ 2	Solve multi-step problems in contexts, including money and decide which operations and methods to use.							
Number	Calculations				Solve problems which require answers to be rounded to specified degrees of accuracy. Example: 5242 eggs = 218 $^{5}/_{12}$ boxes of 24. Make up 218 full boxes	Solve problems involving addition and multiplication of decimals							
Number	Calculations				Subtract decimal numbers using mental or written counting up or other mental strategies Example: 23.47 – 20.3, 43.81 – 17.9, 35.25 – £3.63	Use mental strategies for multiplication of decimals with one non-zero digit							
Number	Calculations				Use conventional notation for priority of operations, including brackets and								
Number	Calculations				Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. Example: 472 ÷ 13 (30 × 13 = 390 and 40 × 13 = 520, so the answer will be between 30 and 40.) How many days might there be in 4936 hours? (200 × 24 = 4800, so just over 200 days)								
Number	Calculations				Use inverse operations								
Number	Calculations				Use knowledge of the order of operations and brackets to carry out multi-step calculations involving addition, subtraction, multiplication and division. Example: 45 – 16 ÷ 4, 24 × 3 – 2, £100 – 3 × £26								
Number	Calculations				Use knowledge of the order of operations, including using brackets, to carry out calculations involving the four operations. Example: 3 × (117 – 95), (3 × 4) + 16, 45 – d = 20 When d = 12								
Number	Calculations				Use short multiplication to multiply 4-digit amounts of money by 1-digit numbers, and use estimation to check answers. Example: £12.78 × 4, £28.39 × 6, £12.01 × 8								
Number	Calculations				use symbols = , ≠, <, >, ≤, ≥								
Number	Calculations				Use the order of operations with brackets, including in more complex calculations								
Number	Combinations					Apply systematic listing strategies					Use the product rule for counting (i.e. if there are m ways of doing one task and for each of these, there are n ways of doing another task, then the total number of ways the two tasks can be done is m × n ways)		
Number	Compound measures						Calculate average speed, distance, time - in mph as well as metric measures						
Number	Compound measures						Convert between metric speed measures						
Number	Rounding			Round numbers to a specified number of decimal places									

Number	Decimals				Add and subtract decimals - positive and negative	Multiply and divide decimals - positive and negative	Understand the effect of multiplying or dividing by any number between 0 and 1	Round numbers and measures to an appropriate degree of accuracy (decimal points or significant figures)					
Number	Direct and indirect proportion					Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. Example: 8 apples cost £1. 16 apples cost £2. How many apples cost £1.50?							
Number	Factors and multiples	Apply simple tests of divisibility (2, 9, 10, 5)	Apply simple tests of divisibility (3, 6, 4, 25)	Find all the factor pairs for any whole number without any support	Find common factors and primes	Find lowest common multiple by listing	Use the HCF to solve problems	Find HCF and LCM using prime factors	Given a number written as a product of it prime factors, use this to write a multiple of the number as a product of its prime factors				
Number	Factors and multiples	Recognise multiples up to 10 × 10		Determine factors and multiples of numbers by listing	Find the HCF or LCM of two numbers	Find the prime factor decomposition of a number less than 100	Use the LCM to solve problems	Recognise that prime factor decomposition of a positive integer is unique					
Number	Factors and multiples			Identify numbers with exactly 2 factors (primes)	Identify common factors, common multiples and prime numbers. Example: What are the common factors of 24 and 30? What is the smallest prime number?	Recognise rules relating to odd and even numbers	Use the HCF and LCM to solve problems	Use prime factorisation to represent a number as a product of its primes using index notation					
Number	Factors and multiples			Recognise and use multiples and factors (divisors) and use simple tests of divisibility	Know the prime factorisation of numbers up to 30, giving answers as powers	Understand the vocabulary of highest common factor, lowest common multiple							
Number	Factors and multiples			Recognise that every number can be written as a product of two factors	Recognise and use common factor, highest common factor and lowest common multiple								
Number	Factors and multiples			Understand the difference between factors, multiples and prime numbers	Recognise two digit prime numbers								
Number	Factors and multiples			Understand the vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples.									
Number	Fractions				Simplify fractions by cancelling all common factors	Multiply fractions less than 1 by whole numbers. Example: $2 \times {}^{2}/_{3}$, $2 \times {}^{5}/_{6}$, $4 \times {}^{2}/_{5}$	Add and subtract fractions – proper and improper, positive and negative	Add and subtract fractions (mixed) - positive and negative	Multiply and divide simple fractions (mixed) - positive and negative				
Number	Fractions				Compare and order fractions, including fractions > 1. Example: Order from smallest to largest: ${}^{7}/_{8}$, ${}^{1}/_{2}$, ${}^{3}/_{4}$ Which is greater, ${}^{4}/_{9}$ or ${}^{2}/_{3}$? ${}^{4}/_{7} < {}^{9}/_{14}$	Multiply pairs of unit fractions by reading the × sign as 'of'. Example: ${}^{1}/_{2} \times {}^{1}/_{5}$, ${}^{1}/_{4} \times {}^{1}/_{3}$, ${}^{1}/_{3} \times {}^{1}/_{7}$	Add and subtract fractions, with different denominators and mixed numbers, using the concept of equivalent fractions. Example: ${}^{1}/_{6} + {}^{1}/_{9}$ ${}^{5}/_{6} - {}^{3}/_{8}$ ${}^{2}/_{3} + {}^{3}/_{5}$	Divide a fraction by an integer	Given a fraction and the result, find the original amount e.g. 4/5 of a number is 20, find the number				
Number	Fractions				Convert improper fractions to mixed numbers; convert mixed numbers to improper fractions. Example: ${}^{9}/_{2} = 4\,{}^{1}/_{2}$, ${}^{6}/_{4} = 1\,{}^{2}/_{4} = 1\,{}^{1}/_{2}$, ${}^{29}/_{12} = 2\,{}^{5}/_{12}$		Associate a fraction with division to find an unknown number using inverse operations. Example: ${}^{88}/_{m} = 4$. What is m? ${}^{w}/_{3} = 12$. What is w?	Divide proper fractions by whole numbers. Example: ${}^{1}/_{3} \div 2$, ${}^{3}/_{5} \div 2$, ${}^{2}/_{3} \div 4$	Multiply and divide mixed numbers				
Number	Fractions				Find non-unit fractions of amounts. Example: ${}^{2}/_{7}$ of 42, ${}^{2}/_{5}$ of 60, ${}^{5}/_{9}$ of 54		Multiply and divide simple fractions – proper and improper, positive and negative	Divide proper fractions by whole numbers. Example: ${}^{3}/_{4} \div 2$, ${}^{1}/_{4} \div 4$, ${}^{1}/_{6} \div 3$					
Number	Fractions				Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. Example: ${}^{14}/_{4} = 3\,{}^{1}/_{2}$, ${}^{16}/_{6} = 2\,{}^{2}/_{3}$ ${}^{2}/_{4}$, ${}^{8}/_{16}$, ${}^{4}/_{8} = {}^{1}/_{2}$		Multiply simple pairs of proper fractions writing the answer in its simplest form; understand that if two numbers less than 1 are multiplied, the answer is smaller than either. Example: ${}^{3}/_{4} \times {}^{1}/_{2}$, ${}^{2}/_{3} \times {}^{1}/_{4}$						
Number	Fractions				Use knowledge of equivalence to compare and order fractions. Example: ${}^{2}/_{3} < {}^{5}/_{6}$ ${}^{7}/_{10} < {}^{4}/_{5}$ ${}^{3}/_{4}$, ${}^{9}/_{12}$, ${}^{30}/_{40} = {}^{3}/_{4}$		Multiply unit fractions by non-unit fractions, writing the answer in its simplest form. Example: ${}^{1}/_{2} \times {}^{2}/_{3}$, ${}^{1}/_{4} \times {}^{2}/_{3}$, ${}^{1}/_{3} \times {}^{3}/_{10}$						
Number	Fractions						Use equivalence to add and subtract proper fractions and mixed numbers with related or unrelated denominators, and spot and test a rule. Example: ${}^{1}/_{2} + {}^{1}/_{3}$, ${}^{1}/_{6} + {}^{1}/_{5}$, ${}^{1}/_{2} - {}^{1}/_{4}$						
Number	Fractions and decimals			Convert terminating decimals to fractions, e.g. 0.23 = 23/100		Convert decimals (up to 3 places) to fractions and vice versa using thousandths, hundredths and tenths. Example: 1.87 = $1\,{}^{87}/_{100}$, 0.078 = ${}^{78}/_{1000}$, ${}^{54}/_{100} = 0.54$							
Number	Fractions and decimals			Recall known facts including fraction to decimal conversions	Associate a fraction with division and calculate decimal fraction equivalents for a simple fraction Example: 1 ÷ 4 = 1/4 = 0.25, 7 ÷ 10 = 7/10 = 0.7, 3 ÷ 8 = 3/8 = 0.375	Convert a terminating decimal to a fraction and simplify the fraction	Use halving and doubling strategies on fractions to find decimal equivalents of other fractions (e.g. 1/4 = 0.25 so 1/8 is half of 0.25, etc.); original fact is given				Convert a recurring decimal to a fraction in simple cases		
Number	Fractions and decimals					Know the denominators of simple fractions that produce recurring decimals and of those that do					Understand a recurring decimal to fraction proof		
Number	Fractions and decimals					Learn fractional equivalents to key recurring decimals (e.g. 0.333333..., 0.66666666..., 0.11111... and by extension 0.222222...)							
Number	Fractions and decimals					Use division to convert a fraction to a decimal							

Number	Fractions and decimals					work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 or 3/8)							
Number	Fractions, decimals and percentages			Calculate simple percentages	Calculate simple fractions of quantities and measurements (whole-number answers)	Use knowledge of equivalence between fractions and percentages and mental strategies to solve problems involving the calculation of percentages, including amounts of money and other measures	Convert a fraction to a decimal to make a calculation easier						
Number	Fractions, decimals and percentages			Extend mental methods of calculation to include percentages	Extend the percentage calculation strategies with jottings to find any percentage (e.g. 17.5% by finding 10%, 5% and 2.5%, and adding together)	Calculate fractions of quantities and measurements (fraction answers)							
Number	Fractions, decimals and percentages					Interpret percentage as the operator 'so many hundredths of'							
Number	Indices, powers and roots	Know square numbers, 10 × 10, 1 × 1 to 5 × 5	Know square numbers 6 × 6 to 9 × 9	Find roots of square numbers unto 100 (i.e. roots up to 10)	Use index notation for squares and cubes and for positive integer powers of 10 (e.g. write 27 as 3^3 and 1000 as 10^3)	Be able to estimate square roots of non square numbers less than 100	Find cube roots by factorising (e.g. cube root of 216 is cube root of 8 × 27 which is 6; 216 = 8 × 27 should be given)	Use the index laws to include negative power answers and understand that these answers are smaller than 1	Calculate with roots (surds - exact values)	Evaluate a number writtern with a negative power	Understand that the inverse operation of raising a positive number to a power n is raising the result of this operation to the power 1/n	Evaluate a number written as a negative or fractional power e.g. $64^{-2/3}$	Solve problems involving negative and fractional indices e.g. $1/16 = 2^n$, $27^{-1/3} \times 9^{3/2}$
Number	Indices, powers and roots							Be able to estimate square roots to 1 decimal place of non square numbers less than 100		Estimate powers and roots of any given positive number			
Number	Indices, powers and roots			Know square numbers beyond 10 × 10		Extend mental calculations to cubes and cube roots	Find square roots by factorising (e.g. square root of 324 is square root of 4 × 81 which is 18; 324 = 4 × 81 should be given)	Use the laws of indices to multiply and divide numbers written in index notation	Use the laws of indices for a number written in index form raised to a power e.g. $(3^2)^4$	Recall that $n^0 = 1$ and $n^{-1} = 1/n$ for positive integers n as well as $n^{1/2} = \sqrt{n}$ and $n^{1/3} = \sqrt[3]{n}$ for any positive number n		Find the value of calculations using indices including fractional and negative indices	
Number	Indices, powers and roots			Recognise the first few triangular numbers		Extend mental calculations to squares and square roots	Use mental strategies to solve word problems set in context using square roots and cube roots mentally	Use the square, cube and power keys on a calculator					
Number	Indices, powers and roots					Find and interpret roots of non square numbers using square root key	Combine laws of arithmetic for brackets with mental calculations of cube roots, e.g. $\sqrt[3]{(89 + 36)}$	Use an extended range of calculator functions, including +, −, x, , x^2, $\sqrt{x}$, memory, x^y, $x^{1/y}$, brackets					
Number	Indices, powers and roots					Give the positive and negative square root of a square number	Combine laws of arithmetic for brackets with mental calculations of cubes, e.g. $(23 − 13 + 4 − 8)^3$						
Number	Indices, powers and roots					Know all the squares of numbers less than 16 and know the square root given the square number	Combine laws of arithmetic for brackets with mental calculations of square roots, e.g. $\sqrt{(45 + 36)}$						
Number	Indices, powers and roots					Recall the cubes of 2, 3, 4, 5 and 10	Combine laws of arithmetic for brackets with mental calculations of squares, e.g. $(23 − 13 + 4 − 8)^2$						
Number	Indices, powers and roots					Use index notation for small integer powers, e.g. $24 = 3 \times 2^3$	Establish index laws for positive powers where the answer is a positive power						
Number	Indices, powers and roots					Use positive integer powers and associated real roots (square, cube and higher)	Extend the patterns by using the index law for division established for positive power answers, to show that any number to the power of zero is 1						
Number	Indices, powers and roots						Mentally calculate the squares of numbers less than 16 multiplied by a multiple of ten, e.g. 0.2, 300, 0.400						
Number	Indices, powers and roots							Use an extended range of calculator functions, including +, −, x , x^2, $\sqrt{x}$, memory, x^y , $x^{1/y}$, brackets					
Number	Percentages				Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. Example: 360 cats are tested. 90 of the cats prefer wet cat food to dry cat food. 90 out of 360 = 90 360 = 1 4 = 25% of cats	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts, and use mental strategies to solve problems involving simple percentages of amounts Example: $^1/_4$ m = 0.75 m = 75% of a metre 10% of £12 = $^1/_{10}$ of £12 = £1.20 $^{90}/_{250}$ = 90 ÷ 250 = 0.36						
					Solve problems involving the calculation of percentages and the use of percentages for comparison. Example: Davinder has been asked to reduce the price of CDs by 10%. How much will a CD costing £12 be reduced by?	Solve problems involving the calculation of percentages and the use of percentages for comparison. Example: 20% of 360 A laptop costs £500. In a sale there is 30% off that price. How much will the laptop cost?						
Number	Place value	Order positive and negative integers	Order positive decimals as a list with the smallest on the left (decimals should be to 4 or 5 significant figures)	Compare decimals in different contexts	Order negative decimals with the largest on the left (decimals should be to 2 or 3 significant figures)	Use the equivalence of fractions, decimals and percentages to compare proportions (i.e. compare a fraction and a percentage)	Order fractions by converting them to decimals or otherwise						
Number	Place value	Read, write, order and compare numbers up to 1 000 000 and determine the value of each digit. Example: 405 297 > 450 279, 570 523 > 507 203, 909 250 < 990 250	Order positive decimals with the largest on the left (decimals should be to 4 or 5 significant figures)	Identify the value of each digit in numbers with up to 3 decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers to up to 3 decimal places; use this knowledge to compare and order numbers, and round numbers, with up to 3 decimal places. Example: 3.924 has nine tenths, two hundredths, f	Order negative decimals with the smallest on the left (decimals should be to 2 or 3 significant figures)		Use one calculation to find the answer to another					

Number	Place value	Use diagrams to compare two or more simple fractions	Use > or < correctly between two positive decimals (decimals should be to 4 or 5 significant figures)	Solve number and practical problems involving rounding of integers. Example: 5 583 532 rounded to the nearest million is 6 000 000.	Use > or < correctly between two negative decimals (decimals should be to 2 or 3 significant figures)								
Number	Place value		Compare and order numbers with 1, 2 or 3 decimal places. Example: Write in order: 2.874, 2.78 and 2.87. Write numbers between 8.24 and 8.25. Which is further, 4.056 km or 4.506 km?	Solve number and practical problems that involve place value in large numbers, rounding, comparison and negative numbers. Example: 57 905 – 4999, 682 421 rounded to the nearest ten thousand is 680 000.	Order fractions, decimals and percentages								
Number	Place value		Know what each digit represents in numbers with up to 2 decimal places	Understand and use decimal notation and place value									
Number	Place value		Put digits in the correct place in a calculation	Use negative numbers in context, and calculate intervals across zero and give generalisations to describe what happens when adding and subtracting with positive and negative numbers. Example: What is the difference between –3 and 2? Which is higher, –16 or –23?									
Number	Place value		Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit. Example: 4 372 195 < 7 816 039, 7 652 771 < 7 653 672	Use negative numbers in context, and calculate intervals across zero. Example: What is the difference in temperature between 6°C and									
Number	Place value		Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit. Example: 7 233 563, 3 811 642, 6 582 684										
Number	Place value		Solve number and practical problems involving place value. Example: 3500 + 6040, 57 905 – 4999										
Number	Ratio						Solve problems involving similar shapes where the scale factor is known or can be found. Example: A model car is $^1/_5$ the size of a real car. If the length of the model car is 86 cm, what is the length of the real car?	Convert between currencies					
Number	Rounding			Approximate before carrying out an addition or subtraction	Check a result by considering whether it is of the right order of magnitude		Know there are different ways of finding an approximate answer	Check reasonableness of answers					
Number	Rounding			Round any whole number to a required degree of accuracy (e.g. 3 497 992 rounded to the nearest million is 3 000 000. 9 646 101 rounded to the nearest million is 10 000 000)	Make estimates and approximations of calculations – use a range of ways to find an approximate answer		Use numbers of any size rounded to 1 significant figure to make standardised estimates for calculations with one step	Estimate answers to calculations by rounding numbers to 1 significant figure					
Number	Rounding			Round any whole number to a required degree of accuracy (e.g. 38 905 rounded to the nearest thousand is 39 000)	Use rounding to the nearest 10 or to a convenient number (e.g. round 62 to 63 when dividing by 9)			Estimate answers to one- or two-step calculations					
Number	Rounding			Round to a given number of decimal places	Work with numbers rounded to whole numbers or to 1 or 2 decimal places to estimate solutions			When using approximations, identify whether the estimate will be an under estimate or an over estimate					
Number	Sets								Understand and use set notation	Understand and use set notation including n(A) and n(A∩B)			
Number	Standard form							Interpret a calculator display using standard form	Convert between large and small numbers into standard form and vice-versa	Add and subtract in standard form without a calculator			
Number	Standard form							Recognise numbers written in standard form	Order numbers written in standard index form	Estimate the answer to calculations of numbers written in standard form			
Number	Standard form							Use standard form display and know how to enter numbers in standard form	Write numbers greater than 10 in standard index form	Multiply and divide numbers in standard form without a calculator			
Number	Standard form								Write numbers less than 10 in standard index form				
Number	Standard form								Write numbers written in standard form as ordinary numbers				
Number	Standard form								Calculate with numbers in standard form using a calculator				
Number	Surds										Simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{(4 \times 3)} = 2\sqrt{3}$)	Rationalise a denominator when the denominator is a single surd e.g. $3/\sqrt{2}$	Rationalise a denominator when the denominator is an expression involving surds e.g. $(6 + \sqrt{2}) / (8 - \sqrt{2})$
Number	Surds										Use fractions, surds and pi in exact calculations, without a calculator	Solve problems involving simplifying surds and rationalising the denominator	Write $(3 - \sqrt{3})^2$ in the form $a + b\sqrt{3}$
Algebra	Equations				Construct linear expressions from worded descriptions, using addition and subtraction (e.g. 'add 7 to a number' gives answer $n + 7$)	Construct equations by linking expressions to given information (e.g. if the expression $2d + 18$ is used to find the cost of hiring a machine for d days and I spend £34 hiring it, form an equation using this information)	Construct and solve simple linear equations with unknown on one side	Construct and solve equations from geometrical information	Construct and solve equations from geometrical information where the unknown is on both sides of the equation	Construct and solve simple quadratic equations by factorising	Construct equations and linear graphs from real life contexts to solve problems	Solve quadratic equations of the form $x^2 + bx + c$ by completing the square	Solve quadratic equations arising from algebraic fractions

Algebra	Equations				Construct expressions from worded descriptions, using addition, subtraction and multiplication e.g. 3a, a + b, 2 + a + b + 3 = 5 + a + b, a × b, a × a	Construct expressions from worded descriptions, using all four basic operations (e.g. $30/x$, $x - y$, $m/2$, $3m + 4$, $a + a + 3$, a^2	Solve linear equations with integer coefficients in which the unknown appears on either side or on both sides of the equation	Construct and solve equations involving brackets or unknown on both sides Example: $5(x + 2) = 22 - x$	Multiply and simplify algebraic fractions	Solve equations of the form (ax +/- b)/c =(dx +/- e)/f [one of c or f ≠ 1]	Find missing coefficients of an quadratic function by substituting values.	Solve quadratic equations such as $ax^2 + bx + c$ by factorising where a ≠ 1	Solve quadratic equations of the form $ax^2 + bx + c$ by completing the square
Algebra	Equations				Enumerate possibilities of combinations of two variables. Example: $a + b + 19 = 28$ and $a \times b = 14$. Work out the possible pairs of numbers that a and b could be. $16 - m - n = 10$. Work out the possible pairs of numbers that m and n could be. $24 \div c = d + 1$. Work out the possible pairs of numbers that c and d could be.	Solve mathematical puzzles and justify their reasoning; spot patterns and make and test predictions. Example: Make as many different squares of four dominoes as you can where all four sides add up to the same total.	Solve simple two-step linear equations with integer coefficients involving brackets, of the form a(x ± b) = c, e.g. 3(x + 4) = 27	Construct and solve equations that involves multiplying out brackets by a negative number (e.g. 4(2a - 1) = 32 - 3(2a - 2))	Rearrange and solve equations involving square root of (x ± b)	Solve linear equations in one unknown with fractional coefficients	Solve simple quadratic equations by using the quadratic formula		Write an quadratic expression $ax^2 + bx + c$ in the form $p(x + q)^2 + r$
Algebra	Equations				Express missing number problems algebraically and identify appropriate methods in order to solve them. Example: $34 + a = 79$. What is the	Solve simple two-step linear equations with integer coefficients, of the form $ax \pm b = c$ (e.g. $3x + 7 = 25$)		Derive a simple formula, including those involving squares, cubes and roots	Rearrange and solve equations involving squares and fractions		Write an quadratic expression $x^2 + bx + c$ in the form $(x + p)^2 + q$		
Algebra	Equations				Find pairs of numbers that satisfy an equation with two unknowns and list in order the possibilities of combinations of two variables. Example: $a \times b = 24$. Work out the possible pairs of numbers that a and b could be			Solve equations involving fractions e.g. x/3 + 2 = 10 or (x + 2)/3 = 10	Solve simple quadratic equations algebraically by factorising				
Algebra	Equations				Find pairs of numbers that satisfy an equation with two unknowns. Example: $a + b + 32 = 39$. Work out the possible pairs of numbers that a and b could be. $c \times d = c + d + 5$. Work out the possible pairs of numbers that c and d could be. $j \times k \div 2 = j + k$. Work out the possible pairs of numbers that j and k could be			Solve equations of the form (ax +/- b)/c =(dx +/- e)/f [one of c or f should be 1]					
Algebra	Equations				Substitute integers into algebraic equations and solve for missing values			Solve linear equations which involve brackets, including those that have negative signs and those with a negative solution					
Algebra	Equations				Use letters to represent missing numbers in number sentences. Example: $14 - b = 9$. What is the value of b? $c + c = 8$. What is the value of			Solve simple equations involving squares e.g. $x^2 + 10 = 74$					
Algebra	Equations				Solve simple one step equations which include fractions (e.g. x/2 = 3 1/2)			Use systematic trial and improvement to find the approximate solution to one decimal place of equations such as $x^3 + x = 50$					
Algebra	Equations				Solve simple linear equations with integer coefficients, of the form ax = b or x +/- b = c, e.g. 2x = 18, x + 7 = 12 or x -3 = 15			Use systematic trial and improvement to find the approximate solution to one decimal place of equations such as $x^3 = 29$					
Algebra	Equations							Use systematic trial and improvement to find the approximate solution to two decimal place of equations such as $x^3 - x = 70$					
Algebra	Expanding brackets				Begin to multiply a single positive term over a bracket containing linear terms e.g. 4(x+3)		Simplify after multiplying a single term over a bracket	Multiply out brackets involving positive terms such as (a + b)(c + d) and collect like terms	Multiply out brackets involving positive or negative terms (a ± b)(c ± d)	Expand double brackets (ax ± b)(cx ± d)	Expand two or more brackets		
Algebra	Expanding brackets						Multiply a single term over a bracket eg ax(bx + c)			Construct more complex expressions involving expanding double brackets (ax ± b)(cx ± d) and simplifying			
Algebra	Expanding brackets									Predict that (a + b)(a - b) = $a^2 - b^2$			
Algebra	Expressions			Substitute positive integers into simple formulae expressed in words	Create basic expressions from worded examples (e.g. 6 more than x = x + 6)	Select an expression/ equation/ formula from a list	Substitute a positive value into the expression x^2	Know and understand the meaning of an identity and use the≠ sign		Divide and simplify algebraic fractions	Simplify algebraic fractions involving factorising quadratic expressions of the form $x^2 \pm bx \pm c$ either in the numerator or denominator.	Simplify algebraic fractions involving factorising quadratic expressions of the form $ax^2 \pm bx \pm c$ where a≠1 either in the numerator or denominator	
Algebra	Expressions			Use function machines to create expressions	Explain the distinction between equations, formulae and functions	Substitute positive and negative integers into simple formulae	Substitute positive integers into expressions involving small powers (up to 3)	Select an expression/ equation/ formula/identity from a list		Add, subtract and simplify algebraic fractions where the denominator is a whole number	Add, subtract and simplify algebraic fractions where the denominators are both algebraic expressions		
Algebra	Expressions			Simplify expressions involving multiplication and division (e.g. 3 x e x f x 5 = 15ef)	Identify formulae and functions	Substitute positive integers into more complex formulae (involving brackets and more than one operation) expressed in letter symbols (e.g. D = n(n − 3)/2 where D is the number of diagonals in a polygon of n sides)		Substitute positive and negative integers into linear expressions and expressions involving powers					
Algebra	Expressions				Identify the unknowns in a formula and a function	Understand the difference between an expression and an equation and the meaning of the key vocabulary 'term'							
Algebra	Expressions				Identify variables and use letter symbols (e.g. in 'the cost of hiring a van...'	Understand the different role of letter symbols in formulae and functions							
Algebra	Expressions			Simplify simple linear algebraic expressions by collecting like terms (e.g. a + a + a, 3b + 2b)	Simplify algebraic expressions by collecting like terms	Write expressions to solve problems representing a situation							

Algebra	Expressions				Substitute integers into more complex formulae expressed in letter symbols, e.g. a/b, ax +/- b								
Algebra	Expressions				Substitute positive integers into simple formulae expressed in letter symbols, e.g. a+/- b, a × b								
Algebra	Factorising			Use distributive law with brackets, with numbers			Manipulate expressions by taking out common factors, not necessarily the highest e.g. 4x + 8 = 2(2x + 4)	Factorise to one bracket by taking out the highest common factors when the highest common factor is one term e.g. 4x + 8 = 4(x + 2) or 4x² + 5x = x(4x + 5)	Factorise quadratic expressions of the form $ax^2 + bx + c$ where $a = 1$, including the difference of two squares	Factorise to one bracket more complex expressions where the factor is an expression e.g. 2q(p + 1) - 3p(p + 1)	Factorise more complex expressions with the difference of two squares e.g. $(p^2 - 4) - (p - 2)^2$	Factorise quadratic expressions of the form $ax^2 + bx + c$ where $a \neq 1$	
Algebra	Factorising						Use the distributive law to take out numerical common factors, e.g. 6a + 8b = 2(3a + 4b)	Recognise when an expression is not factorised completely.	Factorise to one bracket by taking out the highest common factors for all terms e.g. $2x^2y + 6xy^2 = 2xy(x + 3y)$				
Algebra	Formulae					Construct simple formulae	Change the subject of a formula in one step e.g. y = x + 4	Find an unknown where it is not the subject of the formula and where an equation must be solved.	Find an unknown where it is not the subject of the formula and where an equation must be solved and involves the square root	Change the subject of a formula including where the subject is the denominator of a fraction	Change the subject of a formula including where the subject is on both sides	Change the subject of a complex formula that involves cubing or cube root e.g. make x the subject of the formula $y = \sqrt[3]{4x}$	
Algebra	Formulae					Substitute numbers into simple formulae	Write the subject of a formula which doesn't need re-arranging using square or square root. E.g. $x^2 = 2a + b$, make x the subject or $\sqrt{x} = 2a$	Rearrange simple equations	In simple cases, change the subject of the formula, e.g. make c the subject of the formula from y = mx + c	Change the subject of a formula involving multiple steps		Change the subject of a complex formula that involves fractions, e.g. make u or v the subject of the formula 1/v + 1/u =1/t	
Algebra	Formulae					Use simple formulae. Example: $V = L \times W \times H$, What does $3n - 1$ mean?			Using simple formulae to solve problems	Change the subject of a formula which involves rearranging and squaring or square root		Change the subject of a more complex formula that involves the square root e.g. make l the subject of the formula T = 2pi √(l/g)	
Algebra	Formulae									In more complex cases, change the subject of the formula, e.g. make t the subject of the formula from p = q + rt			
Algebra	Functions		Example: 1/4 m = 0.75 m = 75% of a metre, 10% of £12 = 1/10 of £12 = £1.20	Find outputs of more complex functions expressed in words (e.g. add 6 then multiply by 3)	Construct functions to describe mappings (completing a number machine)	Express simple functions in symbols		Given f(x) where f(x) is a linear function, find a when f(a) = whole number	Given f(x) find f(a) where a is a integer or fraction		Given f(x) where f(x) is a non linear function, find a when f(a) = whole number		Find f(x) + g(x), 2f(x), f(3x) etc. algebraically
Algebra	Functions			Find the inputs of simple functions expressed in words by using the output and inverse operations	Find outputs of more complex functions and inputs using inverse operations	Generate four quadrant coordinate pairs of simple linear functions					Use function notation		Find the inverse of a linear function
Algebra	Functions			Use function machines to find coordinates									Interpret the succession of two functions as a 'composite function' e.g. for f(x) and g(x) find gf(x)
Algebra	Graphs		Read x and y coordinates in the first quadrant	Discuss and interpret line graphs and graphs of functions from a range of sources	Describe positions on the full coordinate grid (all four quadrants). Example: Draw and join these points: A (1, –1), B (5, –1), C (1, –5). Reflect this triangle in the y-axis and write the new coordinates. What do you notice?	Draw and use graphs to solve distance-time problems.	Begin to consider the features of graphs of simple linear functions, where y is given explicitly in terms of x, e.g. y = x, y = 2x, y = 3x are all straight lines that pass through the origin, vary in steepness depending on the function	Construct a table of values, including negative values of x for a function such as $y = ax^2$	Find the equation of a straight-line from its graph	Calculate the acceleration by working out the gradient of a line on a velocity time graph	Deduce turning points by completing the square	Construct the graphs of simple loci including the circle $x^2 + y^2 = r^2$ for a circle of radius r centred at the origin of the coordinate plane	Apply to the graph of $y = f(x)$ the transformations $y = –f(x)$, $y = f(–x)$ and $y = -f(–x)$ for linear, quadratic, cubic, sine and cosine functions
Algebra	Graphs			Draw, label and scale axes	Identify points with given coordinates and coordinates of a given point in all four quadrants	Draw and recognise lines parallel to axes, and also $y = x$ and $y = –x$	Discuss and interpret linear and non linear graphs from a range of sources	Find the equation of a real-life straight line graph that goes through the origin	Generate points and plot graphs of simple cubic functions, then more general functions	Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function	Find the equation of a real-life straight line graph DOES NOT pass through the origin	Find the gradient of the radius that meets the circle at a given point	Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$ and $y = af(x)$ for linear, quadratic, cubic, sine and cosine functions of x
Algebra	Graphs			Draw, straight-line graphs for real-life situations	Plot a graph given a table of values	Find the coordinates of points identified by geometrical information in 2D (all four quadrants) for simple shapes (e.g. squares and	Draw distance–time graphs and velocity–time graphs	Generate points and plot graphs of simple quadratic functions, then more general functions	Given the coordinates of points A and B, calculate the length of AB	Find the coordinates of the midpoint of a line from coordinates using a formula	Find the equation of the line through one point with a given gradient	Interpret transformations of graphs and write the functions algebraically, e.g. write the equation of f(x) + a or f(x - a)	Calculate the distance travelled by finding the area of a velocity time graph by using rectangles and/or trapeziums
Algebra	Graphs			Read values from straight-line graphs for real-life situations	Plot a simple distance-time graph (straight-line graphs)	Interpret information from a complex real life graph (fixed charge/unit cost), read values and discuss trends	Find the coordinates of the midpoint of a line from a given graph	Identify parallel lines from their equations when they are in the form $y = mx + c$	Identify and interpret gradient and y-intercept from an equation $y = mx + c$	Generate points and plot graphs of more complex cubic functions	Find the equation of the line through two given points	Plot graphs of the exponential function $y = k^x$ for integer values of x and simple positive values of k	Estimate area under a quadratic graph by dividing it into trapezia
Algebra	Graphs			Use conventions and notation for 2D coordinates in all four quadrants	Plot a simple real life graph	Plot a graph of a simple linear function in the first quadrant.	Given the coordinates of points A and B, calculate the midpoint of AB	Identify the y intercept from an equation y=mx+c	Identify and interpret roots, intercepts and turning points of a quadratic graph	Identify and interpret gradient from an equation ax+by=c	Interpret and analyse a straight line graph and generate equations of lines parallel and perpendicular to the given line	Recognise, sketch and interpret graphs of trigonometric functions (in degrees) for sin, cos and tan within the range -360° to +360°	Estimate the acceleration of a point on a velocity time graph (non-linear), by drawing the tangent at a point in time, and calculating the gradient.
Algebra	Graphs				Plot and draw graphs of y = a, x = a, y = x and y = -x	Plot and draw graphs of straight lines using a table of values given in the form $y = mx + c$	Plot the graphs of simple linear functions in the form y = mx + c in four quadrants	Interpret graphs including the rate of change	Identify parallel lines from their equations where they have to be rearranged first	Identify and interpret roots and intercepts of a cubic graphs	Know that a cubic function can have 1, 2 or 3 solutions	By re-arranging an equation and drawing a straight line on a graph, find estimates for the solution of an equation	Estimate the average acceleration by calculating the gradient of the chord between two points on a velocity time graph which is curved
Algebra	Graphs				Read x and y coordinates in all four quadrants		Recognise that equations of the form y = mx + c correspond to straight-line graphs in the coordinate plane	Know that the gradient of a line is the change in y over change in x	Identify the line of symmetry of a quadratic graph	Interpret real life exponential graphs	Know that a line perpendicular to the line y = mx + c, will have a gradient of -1/m		Find an accurate root of a quadratic or cubic equation using an iterative process
Algebra	Graphs						Use gradients to interpret how one variable changes in relation to another	Plot and draw graphs of straight lines using a table of values given in the form ax + by = c	Interpret distance-time graphs and calculate the speed of individual sections, total distance and total time	Recognise, sketch and interpret graphs of simple cubic functions	Know that the area under a velocity time graph is the distance travelled		Know if the estimate under a quadratic graph is an over-estimate or under-estimate
													Find the equation of a tangent to a circle at a given point
Algebra	Graphs						Interpret distance-time graphs	Plot the graphs of linear functions in the form y = mx + c and recognise and compare their features	Interpret gradient as rate of change in distance-time and speed-time graphs, containers emptying and filling and unit price graphs	Recognise, sketch and interpret reciprocal graphs	Sketch a graph of a quadratic function by factorising and identifying roots, y-intercept and turning point		Given the graph of an exponential function $y = ab^x$, work out the value of a and b
Algebra	Graphs							Recognise a graph which represents a quadratic function	Interpret velocity–time graphs	Use quadratic and cubic graphs to find the solution to equations where the equation does not need to be rearranged	Use quadratic and cubic graphs to find the solution to equations where the equation needs to be rearranged		Identify turning points when the graph of y=f(x) has been transformed by y=-f(x) y=f(-x) y=-f(-x)
Algebra	Graphs							Recognise that linear functions can be rearranged to give y explicitly in terms of x e.g. rearrange y + 3x - 2 = 0 in the form y = 2 - 3x	Know that the gradient of a velocity time graph represents acceleration	Use real life contexts to draw and use conversion graphs	Write down the equation of a line perpendicular to a given line		Interpret coordinates for trigonometric graphs

Algebra	Graphs							Without drawing the graphs, compare and contrast features of graphs such as y = 4x, y = 4x + 6, y = x + 6, y = -4x, y= x - 6	Plot and draw graphs of straight lines WITHOUT using a table of values (use intercept and gradient)				Interpret the gradient of linear or non-linear graphs, and estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient
Algebra	Graphs								Generate points and plot graphs of simple reciprocal functions e.g. y = 3/x using a calculator to generate points		Plot graphs of exponential functions in the form $y = a^x$ for integer values of x and simple positive values of a		Plot graphs of exponential functions in the form $y = ab^x$ for integer values of x and simple positive values of a and b
Algebra	Graphs								Recognise that when the linear and inverse of a linear function such as y = 2x, y = 3x are plotted, they are a reflection in the line y = x				
Algebra	Graphs								Write down the equation of a line parallel to a given line				
Algebra	Graphs								Recognise a quadratic function from its equation and explain the shape of it's graph	Recognise, sketch and interpret graphs of cubic, reciprocal and exponential functions		Recognise graphs of simple cubic, reciprocal and exponential functions and the trigonometric functions (in degrees)	
Algebra	Inequalities			Use the correct notation to show inclusive and exclusive inequalities			Show inequalities on a number line	Know that when dividing an inequality by a negative number the inequality sign changes	Represent inequalities in one variable graphically	Solve two simultaneous inequalities algebraically and show the solution set on a number line or give the integer solutions	Solve linear inequalities in two variables graphically	Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values	
Algebra	Inequalities						Write down whole number values that satisfy an inequality	Represent the solution set for inequalities using set notation	Solve more complex linear inequalities in one variable and represent the solution on a number line e.g. -6 < 2n+4 or -9 < 2n + 3 < 7		Write the inequalities that represent a shaded region		
								Solve simple linear inequalities in one variable and identify integer solutions					
Algebra	Inequalities							Solve simple linear inequalities in one variable and represent the solution on a number line e.g. 3n + 2 <11 and 2n - 1 >1	Solve more complex linear inequalities in one variable where the unknown is on both sides of the inequality				
Algebra	Proof								Find a counter-example to prove that a statement is not true	Argue mathematically to show algebraic expressions are equivalent e.g. 2x(x + 3) - 4(3x - x^2) = 6x(x - 1)	Use algebra to support proofs e.g. show that the volume of a cube with side lengths of (2x - 1)cm is (8x^3 - 12x^2 + 6x - 1)cm^3	Answer simple proof and 'show that' questions using consecutive integers (n, n+ 1), squares a^2, b^2, even numbers 2n, and odd numbers 2n + 1	
Algebra	Proof								Use algebra to support and construct arguments		Use algebra to support simple proofs e.g. show that the area of a square of length (x + 2) = x^2 + 4x + 4		
Algebra	Sequences			Describe simple functions in words (e.g. add 3, multiply by 6, subtract 4)	Continue, generate and describe linear number sequences. Example: $2 \times n + 1$ = 3, 5, 7, 9, … , 17, 19, 21 $3 \times n$ = 3, 6, 9, 12, … , 24, 27, 30 $5 \times n + 1$ = 6, 11, 16, 21, … , 41, 46, 51	Begin to use linear expressions to describe the nth term in a one-step arithmetic sequence (e.g. nth term is 3n or n + 5)	Begin to use formal algebra to describe the nth term in an arithmetic sequence.	Find and use the nth term of an arithmetic sequence	Identify which terms cannot be in a sequence	By looking at the spatial patterns of triangular numbers, deduce that the nth term is 1/2n(n + 1)		Find the nth term of a quadratic sequence of the form n^2 ,an^2, $an^2 \pm b$, $an^2 \pm bn \pm c$	Use iteration with simple converging sequences
Algebra	Sequences			Find the next term in a sequence, including negative values	Find a specific term in the sequence using term-to-term rules	Begin to use linear expressions to describe the nth term in a two-step arithmetic sequence (e.g. nth term is 3n + 1 or n/2 − 5)	Find a specific term in the sequence using position-to-term rules			Continue a quadratic sequence and use the nth term to generate terms			
Algebra	Sequences			Generate and describe simple integer sequences – square and triangle numbers	Find a term given its position in a sequence like tenth number in 4 × table is 40 (one operation on n)	Explain the rule for the sequence of triangle numbers given the terms in the sequence	Generate arithmetic sequences of numbers , squared integers and sequences derived from diagrams			Continue geometric progression and find term to term rule, including negative, fraction and decimal terms			
Algebra	Sequences			Generate terms of a more complex sequence arising from practical contexts	Find a term of a practical sequence given its position in the sequence	Generate terms of a linear sequence using position to term with positive integers.	Use function machines to find terms of sequence			Distinguish between arithmetic and geometric sequences			
Algebra	Sequences			Generate terms of a simple sequence arising from practical contexts	Generate and describe integer sequences such as powers of 2 and growing rectangles	Predict how the sequence should continue and test for several more terms	Reason mathematically the nature of terms in a sequence (e.g. odd, even, multiples)			Generate the sequence of triangle numbers by considering the arrangement of dots and deduce that T(n) = 1 + 2 + 3 + ... + n, the sum of the series			
Algebra	Sequences			Generate terms of a simple sequence using term to term rules like +3, -2	Generate terms of a linear sequence using term-to-term using positive or negative integers	Recognise arithmetic sequences from diagrams and draw the next term in a pattern sequence				Recognise and use simple geometric progressions (rn where n is an integer and r is a rational number > 0 or a surd)			
Algebra	Sequences			Recognise sequences including those for odd and even numbers	Know that an arithmetic sequence is generated by a starting number , then adding a constant	Recognise simple sequences, including triangular, square and cube numbers and Fibonacci-type sequences				Use finite/infinite and ascending/ descending to describe sequences			
Algebra	Sequences				Write the term-to-term definition of a sequence in								
Algebra	Simplifying			Use notation and symbols correctly	Know that expressions can be written in more than one way, e.g. 2 × 3 + 2 × 7 = 2(3 + 7)		Know that expressions involving repeated multiplication can be written as n, n^2, n^3		Simplify expressions involving brackets and powers e.g. $x(x^2+x+4)$, 3(a + 2b) − 2(a + b)	Square a linear expression and collect like terms			Simplify and manipulate algebraic expressions involving surds and algebraic fractions
Algebra	Simplifying				Multiply together two simple algebraic expressions, e.g. 2a × 3b		Understand the difference between 2n and n^2						
Algebra	Simplifying				Use arithmetic operations with algebra								
Algebra	Simplifying expressions							Simplify simple expressions involving index notation	Simplify more complex expressions involving index notation. E.g. $3a^4b^2 \times 5a^3b^{-1}$, $(3a^4)^2$				
Algebra	Simultaneous equations								Recognise equivalent equations (e.g. 4x + 2y = 7, 8x + 4y = 14) and understand that these cannot be solved simultaneously	Set up and solve a pair of simultaneous equations in two variables	Find approximate solutions to simultaneous equations formed from one linear function and one non-linear (quadratic or circle) function using a graphical approach		Solve exactly, by substitution, a pair of linear and quadratic simultaneous equations
Algebra	Simultaneous equations								Solve linear/linear simultaneous equations graphically	Solve exactly, by elimination of an unknown, linear/linear simultaneous equations, including where both need multiplying			Solve exactly, by substitution, simultaneous equations where one is linear and one is in the form $x^2 + y^2 = r^2$

Algebra	Simultaneous equations								Solve two linear simultaneous equations algebraically, where neither or one equation needs multiplying	Solve exactly, by substitution, linear/linear simultaneous equations			
Algebra	Simultaneous equations								Write simultaneous equations to represent a situation	Solve simultaneous equations representing a real-life situation graphically and interpret the solution in the context of the question			
Geometry and measures	Accurate drawing		Measure lines to the nearest millimetre	Begin to estimate the size of angles	Give a bearing between the points on a map or scale plan		Given the bearing of point A from point B, work out the bearing of B from A	Mark on a diagram the position of point B given its bearing from the point A					
Geometry and measures	Accurate drawing		Use a protractor to measure acute angles to the nearest degree	Measure shapes to find perimeters and areas	Understand and use the language associated with bearings			Use accurate drawing to solve bearings problems					
Geometry and measures	Accurate drawing			Use a protractor to draw acute angles to the nearest degree	Use a protractor to draw obtuse angles to the nearest degree								
Geometry and measures	Accurate drawing			Use a protractor to measure obtuse angles to the nearest degree	Use a protractor to draw reflex angles to the nearest degree								
Geometry and measures	Accurate drawing			Use a protractor to measure reflex angles to the nearest [illegible]	Use a bearing to specify direction								
Geometry and measures	Angle properties	Explain why some shapes tessellate and why other shapes do not	Identify parallel lines	Consolidate classifying angles as acute, right, obtuse or reflex. Example: 23° = acute 90° = right angle 151° = obtuse 252° = reflex	Calculate angles around a point	Identify alternate and corresponding angles on parallel lines and their values.	Calculate the interior angles of regular polygons	Calculate the interior angles of polygons	Solve angle problems by constructing and solving equations				
Geometry and measures	Angle properties	Know the sum of angles on a straight line	Know the sum of angles around a point	Distinguish between acute and obtuse angles	Derive and use the fact that an exterior angle of a triangle is equal to the sum of the two opposite interior angles	Know that the sum of the exterior angles in a polygon is 360°	Compare and classify geometric shapes based on their properties and sizes and use mathematical reasoning to find unknown angles in any triangles, quadrilaterals, and regular polygons. Example: Angles in a regular pentagon add up to 540°, Angles in a regular hexagon add up to 720° , Angles in a regular octagon add up to 1080°	Find the size of each interior angle or the size of each exterior angle or the number of sides of a regular polygon	Solve two or more step angle problems using angle facts for parallel lines including the use of bearings				
Geometry and measures	Angle properties	Tessellate combinations of polygons		Distinguish between acute, obtuse and reflex angles	Derive and use the sum of angles in a triangle and a quadrilateral	Solve harder problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, by looking at several shapes together	Prove the sum of the interior angles in a triangle using parallel lines	Use the sum of the interior angles of an n-sided polygon	Use two or more step angle problems by finding interior or exterior angles in regular polygons				
Geometry and measures	Angle properties			Identify perpendicular lines	Identify interior and exterior angles in a shape		Use the sum of angles in a triangle to deduce and use the angle sum in any polygon						
Geometry and measures	Angle properties			Use correct notation for labelling angles	Know the definition of a set of lines that are perpendicular to [illegible]		Use the fact that the sum of the exterior angles of any polygon is 360°						
Geometry and measures	Angle properties				Recognise and use vertically opposite angles		Use co-interior angles and their values to decide if two lines are parallel						
Geometry and measures	Angle properties				Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. Example: Angles on a straight line add up to 180°. The given angles are 70° + 45° = 115°. The missing angle is [illegible]		Identify co-interior angles and their values.						
Geometry and measures	Angle properties				Use sum of angles in a triangle to find missing angle values								
Geometry and measures	Angle properties				Use the fact that the sum of the interior angle and the exterior angle is 180°								
Geometry and measures	Area and volume	Find the perimeter of a square/rectangle by counting	Find the perimeter of a square/rectangle	Calculate perimeter and area of compound shapes made from triangles, rectangles and other shapes	Calculate the areas of more complex shapes made from rectangles	Calculate areas of compound shapes made from rectangles and triangles	Calculate surface areas of shapes made from cuboids, for lengths given as whole numbers	Calculate the lengths and areas given the volumes in right prisms	Find the surface area of simple shapes (prisms) using the formulae for triangles and rectangles, and other shapes	Calculate the volume and surface area of pyramids, cones and spheres	Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders	Use the formulae for length of an arc and area of a sector of a circle to solve problems	Find the area of a segment of a circle given the radius and length of the chord
Geometry and measures	Area and volume			Calculate the surface area of cubes with a net	Calculate the areas of simple shapes made from rectangles	Deduce and use formulae for the area of a triangle	Calculate the volume of cuboids	Calculate the lengths, areas and volumes in cylinders	Recognise the formulae for area of sectors in a circle.	Use the formulae to find the length of an arc and the area of a sector	Solve problems including examples of solids in everyday use		Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones
Geometry and measures	Area and volume				Work out the missing lengths in a compound shape made from two rectangles	Solve problems involving the area of rectangles where lengths need to be converted to different units							
Geometry and measures	Area and volume			Use nets to calculate the surface area of simple cuboids	Calculate the perimeters and areas of shapes made from rectangles	Find the area of triangles by counting i.e. adding full and partial squares	Deduce and use the formula for the area of a trapezium	Calculate the surface area of right prisms	Recognise the formulae for length of arcs in a circle.		Solve complex area problems where missing sides need to be found using other areas of mathematics		
Geometry and measures	Area and volume			Use the formula for the area of a rectangle/square	Calculate the surface areas of cubes, without a net	Know the formulae for the volume of cube and a cuboid	Deduce and use the formula for the area of a parallelogram	Calculate the volume of right prisms					
Geometry and measures	Area and volume				Calculate the surface areas of simple cuboids (without use of nets)	Use a formula to calculate the areas of parallelograms	Know the formulae for the circumference and area of a circle	Calculate volumes of shapes made from cuboids, for lengths given as whole numbers					
Geometry and measures	Area and volume					Use a formula to calculate the areas of triangles	Use a formula to calculate the areas of trapezia	Find the perimeters and areas of semicircles and quarter circles					
Geometry and measures	Area and volume					Calculate the area of parallelograms and triangles. Example: Parallelogram: base = 15 cm, height = 8 cm. A = 120 cm^2	Use the formula for the circumference of a circle	Use the formulae for the circumference and area of a circle, given the circumference or area, to calculate the radius or diameter					
Geometry and measures	Area and volume					Calculate the area of rectangles, parallelograms and triangles. Example: Rectangle: Length = 6 cm, width = 7 cm. Area = 6 cm × 7 cm = 42 cm^2	Use the formulae for the area of a circle, given the radius or diameter						

Geometry and measures	Area and volume					Measure areas and perimeters; understand that area is a measurement of covering and is measured in square units and that perimeter is a length measured in mm, cm, m or km, for example; recognise that shapes with the same areas can have different perimeters and vice versa. Example: Length = 12 cm, width = 7 cm Perimeter = 2*l* + 2*w*. Double 12 is 24,	Solve problems involving areas of rectangles and triangles (e.g. find missing lengths when area is given)						
Geometry and measures	Area and volume				Work out the volume of 3D shapes by counting cubes	Recognise when it is possible to use formulae for area and volume of shapes. Example: The formula for the area of a triangle is $A = 12\ b \times h$ The formula for the area of a parallelogram is $A = b \times h$ The formula for the volume of a cuboid is $V = L \times W \times H$							
Geometry and measures	Circle theorems								Solve problems involving angles, triangles and circles	Prove and use facts about the angle subtended at the centre and at the circumference;	Use circle theorems including tangent properties to circles to prove results	Give reasons for angle and length calculations involving the use of tangent theorems	
Geometry and measures	Circle theorems									Prove and use the fact that angles in the same segment are equal		Give reasons for angle sizes using mathematical language	
Geometry and measures	Circle theorems									Prove and use the fact that opposite angles of a cyclic quadrilateral sum to 180°		Prove and use the alternate segment theorem	
Geometry and measures	Circle theorems									Prove and use the fact that the angle in a semicircle is a right angle		Use a combination of circle theorems to prove geometrical problems	
Geometry and measures	Congruence				Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)	Know and understand the term 'congruent'	Find the scale factor of similar shapes where the scale factor is a whole number	Begin to use congruency to solve simple problems in triangles and quadrilaterals	Use similarity to solve problems in 2D shapes		Use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations	Find the scale factor of similar shapes, given the area scale factor or volume scale factor	Solve problems involving areas and volumes of similar shapes and solids
Geometry and measures	Congruence					Know that translations, rotations and reflections map objects on to congruent images	Identify 2D shapes that are congruent or similar by reference to sides and angles	Find the scale factor of similar shapes where the scale factor is a fraction	Use simple examples of the relationship between enlargement and areas and volumes of simple shapes and solids				
Geometry and measures	Congruence						Identify congruent shapes	Use the information given about the length of sides and sizes of angles to determine whether triangles are congruent, or similar		Prove using angle facts on parallel lines if two triangles are congruent			
Geometry and measures	Congruence						Identify corresponding sides and angles in similar shapes	Use the scale factor of similar shapes to find missing lengths where the scale factor is a fraction					
Geometry and measures	Congruence						Identify shapes that are similar, including all regular polygons with equal numbers of sides						
Geometry and measures	Congruence						Know that triangles given SSS, SAS, ASA or RHS are unique, but that triangles given SSA or AAA are not						
Geometry and measures	Congruence						Recognise that all corresponding angles in similar shapes are equal in size when the corresponding lengths of sides are not equal in size						
Geometry and measures	Congruence						Use the scale factor of similar shapes to find missing lengths where the scale factor is a whole number						
Geometry and measures	Constructions	Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone	Construct diagrams of everyday 2D situations involving rectangles, triangles, and perpendicular and parallel lines	Construct diagrams of everyday 2D situations involving rectangles, triangles, and perpendicular and parallel lines	Begin to use plans and elevations	Identify simple nets of 3D shapes - regular polyhedra	Analyse 3D shapes through 2D representations.	Construct angles of 60°, 90°, 30°, 45°	Understand how standard constructions using straight edge and compasses relate to the properties of two intersecting circles with equal radii	Shade regions given two or more loci rules			
Geometry and measures	Constructions	Identify complex arrangements of a net of an open cube	Know and use geometric properties of cuboids	Know and use geometric properties of cuboids	Recognise and sketch the nets of prisms including cuboid, triangular prism, right prisms, cylinders	Use straight edge and compasses to construct the midpoint and perpendicular bisector of a line segment	Analyse 3D shapes through cross-sections, plans and elevations	Draw the locus equidistant between 2 points or from a point	Understand that a locus in 3D can be a plane or curved surface and extend understanding of loci to include 3D problems, e.g. know that all the points equidistant from a single point in space form the surface of a sphere				
Geometry and measures	Constructions	Identify complex arrangements of a net of a closed cube		Draw 2D shapes using given dimensions and angles. Example: Use a ruler and a protractor to draw a square with 7 cm sides. Draw a right-angled triangle with base 8 cm and height 6 cm and work out what the two missing angles are	Recognise, describe and build simple 3D shapes, including making nets. Example: Cube: 6 faces, 12 edges, 8 vertices, faces are squares Cylinder: 3 faces, 2 edges, 0 vertices, faces are two circles and a rectangle		Construct a regular hexagon inside a circle	Produce shapes and paths by using descriptions of loci					
Geometry and measures	Constructions	Know the terms face, edge and vertex		Identify different nets of a cuboid	Use ruler and protractor to construct simple nets of 3D shapes, using squares, rectangles and triangles (e.g. regular tetrahedron, square-based pyramid, triangular prism)		Construct an equilateral triangle	Understand loci about a point, line and corner					
Geometry and measures	Constructions			Know and use geometric properties of shapes made from cuboids			Deduce properties of simple 3D shapes from their 2D representations	Use construction to find the locus of a point that moves according to a rule					
Geometry and measures	Constructions			Sketch the faces of a cube or cuboid			Draw plans and elevations of 3D shapes	Use straight edge and compass to construct the perpendicular from or to a point on a line segment					
Geometry and measures	Constructions						Identify more complex nets of 3D shapes including irregular polyhedra	Use straight edge and compasses to construct a triangle, given right angle, hypotenuse and side (RHS)					

Geometry and measures	Constructions						Use straight edge and compasses to construct a triangle given three sides (SSS)						
Geometry and measures	Constructions						Use straight edge and compasses to construct the bisector of an angle						
Geometry and measures	Graphs					Identify coordinates on the full coordinate grid; find missing coordinates for a vertex on a polygon or line. Example: A parallelogram has given points *A* : (–5,3), *B* : (2,3), *C* : (–8,5). What are the coordinates of point *D* ?							
Geometry and measures	Measurement	Read and interpret scales on a range of measuring instruments	Choose suitable metric units to estimate length and area	Know that measurements using real numbers depend upon the choice of unit	Solve simple problems involving units of measurement in the context of length and area	Solve problems using standard units; read scales with accuracy. Example: A jug contains 450 ml of water. If 150 ml is added, how much water is in the jug now? 24 mm + 29 mm + 30 mm, 550 g – 200 g	Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units (for example, mm^3 and km^3). Example: 5 cm × 4 cm × 6 cm = 120 cm^3 3 m × 10 m × 3 m = 90 m^3	Convert between miles and kilometres. Example: 50 miles = 80 km, 30 km = 18.75 miles, 54 miles = 86.4 km					
Geometry and measures	Measurement	Record readings from scales to a suitable degree of accuracy	Consolidate using 12 and 24-hour clocks; use counting up to calculate time intervals and count on and back in hours and minutes, bridging the hour, to find start and finish times; use timetables. Example: How many days and weeks are in two and a half months?	Recognise that shapes with the same areas can have different perimeters and vice versa; begin to measure area and perimeter. Example: Perimeter = 7 cm + 5 cm + 7 cm + 5 cm = 24 cm Area = 7 cm × 5 cm = 35 cm^2 Perimeter = 6 cm + 6 cm + 6 cm + 6 cm = 24 cm Area = 6 cm × 6 cm = 36 cm^2 Perimeter = 9 cm + 4 cm + 9 cm + 4 cm = 26 cm			Calculate, estimate and compare volumes of cubes and cuboids. Example: 6 cm × 7 cm × 11 cm = 462 cm^3 12 cm × 8 cm × 3 cm = 288 cm^3						
Geometry and measures	Measurement	Suggest suitable units to estimate or measure length, mass and capacity	Understand that area is measured in square centimetres	Record estimates to a suitable degree of accuracy			Solve problems involving the calculation and conversion of units of measure. Example: 1 m 52 cm = 1520 mm, 1000 kg = 1 tonne, A reel holds 250 m of cable. How many reels are needed to make 1 km of cable?						
Geometry and measures	Measurement	Work out time intervals		Use units of measurement to estimate and solve problems in everyday contexts involving length, area, volume, mass, time and									
Geometry and measures	Measurement			Convert units of time from hours to minutes of from minutes to hours	Convert between metric units of length								
Geometry and measures	Parallel lines		Draw parallel lines										
Geometry and measures	Parallel lines		Mark parallel lines on a diagram										
Geometry and measures	Right-angled triangles							Know the formula for Pythagoras' theorem and use to find the hypotenuse	Use the trigonometric ratios to find the size of an angle in a right-angled	Find angles of elevation and angles of depression	Solve problems involving the application of both Pythagoras' theorem and trigonometry in right-angled triangles	Calculate the length of a diagonal of a cuboid	Find the angle between a line and a plane (but not the angle between two planes or between two
Geometry and measures	Right-angled triangles								Know the formula for Pythagoras' theorem and use to find a shorter side	Use Pythagoras' theorem to solve problems involving the area of triangles	Understand, recall and use Pythagoras' theorem in 3D problems		Use the trigonometric ratios to solve 3D problems
Geometry and measures	Right-angled triangles								Use pythagoras theorem to prove if a triangle is a right-angled triangle				
Geometry and measures	Right-angled triangles						Label a triangle opposite, adjacent and hypotenuse		Understand the language of planes, and recognise the diagonals of a cuboid	Use the appropriate ratio to find a length, or angle, and hence solve a two-dimensional			
Geometry and measures	Right-angled triangles						Use a calculator to work out inverse trig functions		Use and apply Pythagoras' theorem to solve problems in 2D	Use the sine, cosine and tangent ratios to find the lengths of unknown sides in a right-angled triangle, using more complex algebraic manipulation, e.g. the hypotenuse (using cosine or sine), or adjacent (using the tangent ratio)			
Geometry and measures	Right-angled triangles						Use a calculator to work out trigonometric functions		Use the sine, cosine and tangent ratios to find the lengths of unknown sides in a right-angled triangle, using straight-forward algebraic manipulation, e.g. calculate the adjacent (using cosine), or the opposite (using				
Geometry and measures	Shape properties	Draw sketches of shapes	Identify quadrilaterals from everyday usage	Calculate angles in a triangle	Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons; find missing angles at a point, vertically opposite, or on a straight line (e.g. Rectangles are quadrilaterals with two sets of	Draw a circle given the radius or diameter	Draw and label diagrams from given instructions	Know that the perpendicular distance from a point to a line is the shortest distance to the line		Know that the perpendicular from the centre to the chord bisects the chord		Understand and use the fact that tangents to a circle from an external point are equal in length	
Geometry and measures	Shape properties	Identify all the symmetries of 2D shapes	Know that the sum of angles in a triangle is 180°	Identify angle, side and symmetry properties of simple quadrilaterals	Draw or complete diagrams with a given number of lines of symmetry		Draw circles and arcs to a given radius			Know that the tangent at any point on a circle is perpendicular to the radius at that point			
Geometry and measures	Shape properties	Recognise properties of rectangles	Recognise reflection symmetry	Identify simple angle, side and symmetry properties of triangles	Draw or complete diagrams with a given order of rotational symmetry		Identify, illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius						
Geometry and measures	Shape properties	Recognise properties of squares	Use correct notation for labelling lines	Mark perpendicular lines on a diagram	Find co-ordinates of points determined by geometric information		Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius						
Geometry and measures	Shape properties			Recognise and visualise the symmetry of a 2D shape: line symmetry	Identify and begin to use angle, side and symmetry properties of quadrilaterals		Know the definition of a circle						

Geometry and measures	Shape properties			Use correct notation for labelling triangles	Identify and plot points determined by geometric information		Know the names of parts of a circle						
Geometry and measures	Shape properties				Identify regular and irregular polygons		Solve geometric problems using side and angle properties of equilateral, isosceles and right-angled triangles						
Geometry and measures	Shape properties				List the properties of each, or identify (name) a given shape	Apply the properties and definitions of a square and use the angles on a straight l							
Geometry and measures	Shape properties				Name all quadrilaterals that have a specific property								
Geometry and measures	Shape properties				Recognise and visualise the rotational symmetry of a 2D shape								
Geometry and measures	Shape properties				Solve geometric problems using side and angle properties of equilateral and isosceles triangles								
Geometry and measures	Shape properties				Solve simple geometric problems using properties of quadrilaterals								
Geometry and measures	Shape properties				Solve simple geometric problems using properties of triangles								
Geometry and measures	Shape properties				Use geometric language appropriately								
Geometry and measures	Shape properties and proof							Determine whether a triangle is right-angled given its three lengths	Derive the fact that base angles of isosceles triangles are equal	Complete a formal geometric proof of similarity of two given triangles			
Geometry and measures	Transformations	Recognise where a shape will be after reflection	Recognise and visualise the reflection in a mirror line of a 2D shape	Recognise and visualise rotation about a given point (rotation point must be outside the shape)	Enlarge a given shape using a whole number scale factor (without a centre of enlargement)	Draw and translate simple shapes on the coordinate plane, and reflect them in the axes. Example: Plot the points (–6, 5), (–4, 3), (–2, 5), (–2, –1), (–4, –3), (–6, –1), and join them. Add the same number to the *x* -coordinates to slide the hexagon across, or to the *y* -coordinates slide the shape up.	Enlarge 2D shapes, given a centre of enlargement and a positive whole number scale factor	Colour in missing squares to complete a reflection	Describe an enlargement using the scale factor and the centre of enlargement where the scale factor is a positive fraction	Describe an enlargement using the scale factor and the centre of enlargement where the scale factor is negative	Describe an enlargement using the scale factor and the centre of enlargement where the scale factor is negative and a fraction		
Geometry and measures	Transformations	Scale a shape on a grid (without a centre specified, and partially completed)	Recognise where a shape will be after translation			Enlarge a given shape using a fractional scale factor such as 1/2 or 1/3 (without a centre of enlargement)	Enlarge a given shape using (0, 0) as the centre of enlargement with a positive whole number scale factor	Describe a transformation	Enlarge a 2D shape given a negative scale factor about a centre (0,0)	Enlarge a 2D shape given a negative scale factor about a centre other than (0,0)	Enlarge 2D shapes, given a negative, fractional scale factor and a centre of enlargement		
Geometry and measures	Transformations	Understand and use the language associated with reflections	Translate a shape on a square/coordinate grid			Know that translations, rotations and reflections preserve length and angle	Enlarge shapes with a centre other than (0, 0) with a positive whole number scale factor	Describe an enlargement using the scale factor and the centre of enlargement where the scale factor is a positive whole number	Transform 2D shapes by a more complex combinations of rotations, reflections and translations, e.g. a reflection, followed by a rotation etc.		Find the coordinates of an object given the coordinates of its image after combinations of different transformations		
Geometry and measures	Transformations	Understand and use the language associated with translations	Understand and use the language associated with rotations			Recognise that enlargements preserve angle but not length	Explore enlargement using ICT	Describe reflections on a coordinate grid	Transform 2D shapes by simple combinations of rotations, translations and enlargements				
Geometry and measures	Transformations						Find the centre of enlargement	Enlarge 2D shapes, given a fractional scale factor with a centre of enlargement (0,0)	Transform 2D shapes by simple combinations of rotations, reflections and translations, using ICT (e.g. repeated reflection, rotation or translation, reflections in the x and y axes, rotations about (0, 0))				
Geometry and measures	Transformations						Find the scale factor of enlargement where the scale factors is a positive whole number	Enlarge 2D shapes, given a fractional scale factor with a centre of enlargement other than (0,0)					
Geometry and measures	Transformations					Rotate shapes about (0,0) given an angle of 90°,180° or 270° and direction of turn	Rotate shapes about a centre of rotation other the (0,0) given an angle of 90° ,180° or 270° and direction of turn	Find the centre of rotation					
Geometry and measures	Transformations							Find the scale factor of enlargement where the scale factors is a positive fraction					
Geometry and measures	Transformations				Reflect shapes in the x or y axes	Reflect shapes in a mirror line parallel to the x or y axis	Reflect shapes on a mirror line such as y = x, y = -x	Recognise whether a reflection is correct	Know the coordinates of points after they have been reflected in the x axis, y axis and line y = -x without a				
Geometry and measures	Transformations								Transform 2D shapes by a more complex combinations of reflections and describe the resultant single transformation				
Geometry and measures	Transformations							Translate a shape using a vector					
Geometry and measures	Transformations							Understand and use the language and notation associated with enlargement					
Geometry and measures	Transformations							Use 2D Vector notation for translation					
Geometry and measures	Transformations							Use vector notation for translations					
Geometry and measures	Trigonometry								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°		Calculate the area of a triangle given the length of two sides and the included angle	Know and apply Area = 1/2 ab sin C to calculate the sides or angles of any triangle	Use the sine and cosine rules to solve 2D and 3D problems
Geometry and measures	Trigonometry										know and apply the cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$ to find unknown lengths	know and apply the cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$ to find unknown angles	
Geometry and measures	Trigonometry										Know and apply the sine rule a/sin A = b/sin B = c/sin C to find unknown lengths and angles		
Geometry and measures	Vectors							Express points as position vectors	Add and subtract column vectors	Add and subtract scalar multiples of column vectors	Calculate the resultant of two vectors	Prove lines are parallel/colinear	Apply vector methods for simple geometrical proofs
Geometry and measures	Vectors							Represent column vectors graphically	Calculate scalar multiples of column vectors		Calculate, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector		
Geometry and measures	Vectors							Represent vectors given graphically as column vectors	Understand the properties of negative vectors		Solve geometrical problems in 2D using vector methods		
Geometry and measures	Vectors							Understand and use vector notation	Add and subtract simple whole number algebraic vectors to find the resultant		Work out the magnitude of a vector		

Probability	Calculations				Apply the property that the probabilities of an exhaustive set of outcomes sum to 1	Compare experimental and theoretical probabilities		Understand and use P(A and B) = P(A) x P(B) for independent events					
Probability	Calculations					Compare relative frequencies from samples of different sizes		Understand and use P(A or B) = P(A) + P(B) for mutually exclusive events					
Probability	Calculations					Estimate the number of times an event will occur, given the probability and the number of trials		Understand and use P(A and B) = P(A) x P(B) for independent events					
Probability	Calculations					Find the theoretical probability of an event happening		Understand and use P(A or B) = P(A) + P(B) for mutually exclusive events.					
Probability	Calculations					Identify different mutually exclusive outcomes and know that the sum of probabilities of all outcomes is 1							
Probability	Calculations					Know that if the probability of an event is *p* , the probability of it not occurring is 1 – *p*							
Probability	Conditional probability								Decide whether two events are independent		Apply the rule that for two independent events A and B, P(A) = P(A|B)		
Probability	Conditional probability										Use a tree diagram to calculate conditional probability		
Probability	Conditional probability										Use a two-way table to calculate conditional probability		
Probability	Conditional probability										Use the formula for conditional probability		
Probability	Conditional probability										Use Venn diagrams to calculate conditional probability		
Probability	Diagrams/listing				Identify all possible mutually exclusive outcomes of a single event	Identify all mutually exclusive outcomes for two successive events with three outcomes in each event	Complete a probability tree diagram for independent events	Record outcomes of events in a Venn Diagram	Complete a probability tree diagram for dependent events understanding replacement and non replacement				
Probability	Diagrams/listing					Identify all mutually exclusive outcomes for two successive events with two outcomes in each event	Draw a probability tree diagram based on given information (no more than 3 branches per event)	Use Venn diagrams to calculate simple probabilities					
Probability	Diagrams/listing					Record outcomes of events in tables and grids							
Probability	Experimental probability				Apply probabilities from experimental data to a different experiment in simple situations (only looking at one outcome) - how many successes would you expect?	Apply probabilities from experimental data to a different experiment (a combination of two outcomes) - how many successes would you expect?	Apply probabilities from experimental data to a different experiment in applying to two-step outcomes (e.g. spin a spinner twice and total the two numbers; which total is more likely?)						
Probability	Experimental probability				Understand and use experimental and theoretical measures of probability, including relative frequency to include outcomes using		Identify conditions for a fair game - from a small set of options						
Probability	Probability scale and language			Mark events and/or probabilities on a probability scale of 0 to 1	Understand and use the probability scale from 0 to 1	Find the probability of an event happening using relative frequency							
Probability	Probability scale and language			Use a probability scale with words	Use the vocabulary of probability	When interpreting the results of an experiment use the vocabulary of probability							
Probability	Probability scale and language					Write probabilities in words, fractions, decimals and percentages							
Probability	Sample space				Find and justify probabilities based on equally likely outcomes in simple contexts		Calculate the probability of the final event of a set of mutually exclusive events.	Use theoretical models to include outcomes using spinners, dice, coins etc.					
Probability	Sample space						Use and draw sample space diagrams						
Probability	Tables					Work out probabilities from frequency tables	Draw a frequency tree based on given information and use this to find probability and expected outcome		Find a missing probability from a list or two-way table including algebraic terms				
Probability	Tables					Work out probabilities from two-way tables	Record outcomes of probability experiments in tables						
Probability	Tree diagrams								Use tree diagrams to calculate the probability of two independent	Use tree diagrams to calculate the probability of two dependent events	Understand selection with or without replacement		
Statistics	Application and justification			Choose and justify appropriate diagrams, graphs and charts, using ICT as appropriate, to illustrate a short report of a statistical	Interpret dual bar charts	Interpret and/or compare bar graphs and frequency diagrams that are misleading (with false origins, different scales etc.)	Identify which graphs are the most useful in the context of the problem			Interpret and analyse information in a range of linear graphs - to describe how one variable changes in relation to another			
Statistics	Application and justification					Interpret pie charts and line graphs taking into account different sized samples	Interpret and discuss data						
Statistics	Construct statistical charts			Answer simple questions about 'most likely' from a simple bar chart	Design and use data collection sheets for grouped, discrete and continuous data	Construct a frequency table with given equal class intervals for continuous data (boundary data given)	Know and use the relationship between the angle in a sector of a pie-chart and frequency to solve problems	Use more complex two way tables					
Statistics	Construct statistical charts			On paper and using ICT, construct simple bar graphs to represent discrete data	Extract data and interpret frequency tables	Construct a simple (no boundary data) frequency table with given equal class intervals for continuous data	Make inferences about data through extracting information from a two way table						
Statistics	Construct statistical charts			On paper and using ICT, construct bar charts and line graphs to represent data	Group data, where appropriate in equal class intervals	Construct complex bar graphs (e.g. compound bar charts)	Produce ordered back-to-back stem and leaf diagrams						
Statistics	Construct statistical charts			Draw conclusions based on the shape of line graphs	Interpret and construct line graphs and use these to solve problems. Example: Show a distance/time line graph showing a cyclist's journey from London to Brighton (54 miles). How long did it take this rider to cycle from London to Brighton? How long did it take to do the first 10 miles?	Construct on paper and using ICT simple pie charts using categorical data, e.g. two or three categories							

Statistics	Construct statistical charts			Extract data and interpret discrete bar charts	Interpret data in a simple table	Construct, using ICT, simple line graphs for time series							
Statistics	Construct statistical charts			Extract data and interpret line graphs	Interpret simple diagrams and charts	Criticise questions for a questionnaire							
Statistics	Construct statistical charts			Find the mode from a discrete data bar chart	Interpret simple pie charts	Design a question for a questionnaire							
Statistics	Construct statistical charts			Find the modal group from a discrete data grouped bar chart	Produce pie charts for categorical data and discrete/continuous numerical data	Design and use two-way tables for discrete and grouped data							
Statistics	Construct statistical charts			Find the mode from any bar chart	Read and interpret a range of tables, graphs, pictograms and bar charts and answer questions relating to data displayed in these. Example: Show a bar chart of the heights of children in a class. How many children are between one point two metres and one point two nine	Design tables recording discrete and continuous data							
Statistics	Construct statistical charts			Produce bar charts including dual bar charts	Understand which representation is most appropriate for the data being presented	Identify where boundary data would go for different use of inequalities. Discrete and continuous data							
Statistics	Construct statistical charts			Produce pictograms	Use information provided to complete a two-way table	Interpret and construct pie charts and use these to solve problems. Example: Show the data where 50 people were asked their favourite classic children's book. Construct a pie chart and use it to find out which is the most popular book							
Statistics	Construct statistical charts			Represent data in a table		Interpret data from complex compound and comparative bar charts							
Statistics	Construct statistical charts					Produce grouped frequency tables for continuous data							
						Draw ordered stem and leaf diagrams							
						Draw ordered stem and leaf diagrams							
						Interpret stem and leaf diagrams							
Statistics	Construct statistical charts					Read, interpret and construct tables, bar charts, pictograms, pie charts and line graphs and use these to solve problems. Example: Show a bar chart of the heights of children in a class. How many children are between one point two metres and one point two nine metres?							
Statistics	Construct statistical charts					Use simple two way tables							
Statistics	Histograms and cumulative frequency graphs							Construct on paper, and using ICT, frequency diagrams for grouped discrete data	Construct cumulative frequency tables	Construct cumulative frequency graphs	Know the appropriate use of Histograms	Construct and interpret histograms from class intervals with unequal width	
Statistics	Histograms and cumulative frequency graphs								Know the appropriate use of a cumulative frequency graph	Interpret cumulative frequency graphs		From a histogram complete a grouped frequency table	
Statistics	Histograms and cumulative frequency graphs									Use cumulative frequency graphs to find the median, quartiles and interquartile range		From a histogram understand and define frequency density	
Statistics	Histograms and cumulative frequency graphs											Understand and use frequency density	
Statistics	Mean, median, mode and range	Find the range from a set of ordered data	Find the range of a small set of data.	Calculate and interpret the mean as an average. Example: Number of goals scored: 4, 7, 9, 5, 7, 8, 6, 2 Mean number of goals = (4 + 7 + 9 + 5 + 7 + 8 + 6 + 2) ÷ 8 = 48 ÷ 8 = 6	Calculate and interpret the mean as an average. Example: Lengths of caterpillars: 3.1 cm, 3.6 cm, 3.4 cm, 3.7 cm, 2.8 cm, 3.2 cm Mean length: (3.1 + 3.6 + 3.4 + 3.7 + 2.8 + 3.2) ÷ 6 = 19.8 ÷ 8 = 3.3	Calculate the mid-interval value	Calculate the mean and range from a frequency table for discrete data	Estimate the mean of grouped data using the mid-interval value	Calculate possible values of the set of data given summary statistics	Estimate the median from a grouped frequency table with unequal class widths	Compare distributions and make inferences, using the shapes of distributions and measures of average and spread, including median and quartiles	Estimate the median (or other information) from a histogram with unequal class width	
Statistics	Mean, median, mode and range			Calculate the mean, median, mode and range for discrete data	Calculate the mean from a simple frequency table	Compare two distributions given summary statistics in more complex cases.	Construct and use frequency polygons to compare sets of data	Find the median, mode and range from a stem and leaf diagram	Calculate the interquartile range of a set of discrete data	Find the median, quartiles and interquartile range for large data sets with grouped data	Compare median and inter-quartile range of two distributions		
Statistics	Mean, median, mode and range			Calculate the median of a set of data	Compare two simple distributions using the range and the mean	Compare two distributions given summary statistics in simple cases	Identify and explain anomalies (outliers) in a data set	Recognise the advantages and disadvantages between measures of average	Compare the mean, median, mode and range as appropriate of two distributions	Produce box plots from raw data and identify outliers when given quartiles and median	Compare the measures of spread between a pair of box plots/cumulative frequency graphs		
Statistics	Mean, median, mode and range			Compare two simple distributions using the range and the mode	Compare two simple distributions using the range and the median	Compare two distributions using the range of data	Recognise when it is appropriate to use mean, median or mode in more complex cases (put in extreme values)	Understand that the frequency represented by corresponding sectors in two pie charts is dependent upon the total populations represented by each of the pie	Find missing data values given the mean and the number of values	From a box plot estimate frequency greater/less than a given value	Estimate the mean from a histogram		
Statistics	Mean, median, mode and range			Draw conclusions from simple statistics for a single	From a pie chart find the mode and the total frequency	Interpret data from compound and comparative bar charts	Recognise when modal class is the most appropriate statistic for grouped data	Estimate the median from a grouped frequency table with equal	Find the missing value given the mean and other data values	Produce a box plot using summary data.	From a cumulative frequency graph estimate frequency greater/less than a given value		
Statistics	Mean, median, mode and range			Find the modal class for a small set of grouped discrete data	Interpret data from simple compound and comparative bar charts		Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values		Given the number of values and mean of two data sets, combine to find the overall mean.		Use a spreadsheet to calculate mean and range and find median and mode		
Statistics	Mean, median, mode and range			Find the modal class for a set of continuous data	Recognise when it is appropriate to use range, mean, median or mode in simple cases (nice data, with no extreme values)				Identify the best average to use for a set of data				
Statistics	Mean, median, mode and range			Find the mode and range for a small set of discrete data	From a frequency table, calculate the range and identify the interval containing the median and mode				Interpret box plots to find median, quartiles, range and interquartile range and draw conclusions				
Statistics	Mean, median, mode and range			Find the mode and range from a bar chart									

Statistics	Mean, median, mode and range			Interpret simple pie charts using simple fractions and percentages and multiples of 10% sections									
Statistics	Mean, median, mode and range			Calculate the mean of a set of data									
Statistics	Sampling						Identify possible sources of bias and plan to minimise it	Decide what data to collect and what analysis is needed	Use random numbers to get a sample	Select and justify a sampling scheme and a method to investigate a population, including random and stratified			
Statistics	Sampling						Identify what primary data to collect and in what format, including grouped data	Know the definition of random sampling					
Statistics	Sampling						Recognise quantitative and qualitative data	Understand how sources of data may be biased					
Statistics	Sampling						Understand how different sample sizes may not be representative of a whole population	Write questionnaire questions to eliminate bias, on timing and location of survey to ensure sample is representative					
Statistics	Sampling						Understand primary and secondary data sources						
Statistics	Sampling						Understand what is meant by a sample and a population		Understand and use the capture-recapture method				
Statistics	Scatter graphs					Draw scatter graphs		Appreciate that correlation is a measure of the strength of the association between two	State how reliable their predictions are from interpolating and extrapolating apparent trends				
Statistics	Scatter graphs					Interpret a scatter graph	Identify and explain anomalies (outliers) on a scatter graph	Describe correlation by inspection: strong or weak; positive, negative or zero					
Statistics	Scatter graphs							Draw a line of best fit by eye and understand what they represent					
Statistics	Scatter graphs							Interpret scatter graphs in terms of the relationship between two variables					
Statistics	Scatter graphs							Interpret correlation in terms of the problem					
Statistics	Scatter graphs							Know that extrapolation might not be reliable					
Statistics	Scatter graphs							Understand that correlation does not imply causality					
Statistics	Scatter graphs							Use a line of best fit, or otherwise, to predict values of one variable given values of the other variable					
Statistics	Scatter graphs							Use interpolation to make predictions					
Statistics	Scatter graphs							Use the line of best fit to make predictions					
Statistics	Scatter graphs							Appreciate that correlation is a measure of the strength of the association between two					
Statistics	Scatter graphs							Describe correlation by inspection: strong or weak; positive, negative or zero					
Statistics	Scatter graphs							Know that extrapolation might not be reliable					
Statistics	Sets								Use Venn diagrams and set notation				
Ratio, proportion and rates of change	Calculations					Use the unitary method to solve simple word problems involving ratio and direct proportion	Divide a given quantity into two parts in a given part : part or part : whole ratio	Compare ratios by changing them to the form 1 : m or m : 1	Interpret and write ratios to describe a situation	Write a ratio as a linear function	Solve problems involving ratios given as mixed numbers		
Ratio, proportion and rates of change	Calculations						Divide a quantity into two parts in a given ratio, where ratio given in ratio notation	Divide a quantity into more than two parts in a given ratio	Solve a ratio problem in context				
Ratio, proportion and rates of change	Calculations						Write a ratio as a fraction						
Ratio, proportion and rates of change	Compound measures							Solve problems using constant rates and related formulae	Solve problems involving compound measures				
Ratio, proportion and rates of change	Compound measures							Understand and use compound measures (density, speed, pressure)	Understand that acceleration is the rate of change of velocity				
Ratio, proportion and rates of change	Conversions				Convert a larger whole number metric unit to a smaller unit (e.g. 3 kilograms to 3000 grams)	Convert one metric unit to another, including decimals (e.g. 3250 grams to 3.25 kilograms, or 3.25kg to 3250g)	Convert between metric measures of volume and capacity e.g. 1 cm³ = 1 ml	Convert between area measures (e.g. mm² to cm², cm² to m², and vice versa)	Convert between metric and imperial measures				
Ratio, proportion and rates of change	Conversions				Convert a smaller whole number metric unit to a larger unit (e.g. 3000 grams to 3		Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons)	Estimate conversions	Convert imperial units to imperial units				
Ratio, proportion and rates of change	Conversions				Convert between simple metric units.			Write lengths, areas and volumes of two shapes as ratios in simplest form	Extend to simple conversions of compound measures (e.g. convert 2 m/s to km/hr)				
Ratio, proportion and rates of change	Direct and indirect proportion						Identify direct proportion from a graph	Interpret the gradient of a straight line graph as a rate of change	In a table of values, recognise the values are in direct proportion if the ratio between the values is constant	Set up equations to show inverse proportion	Calculate an unknown quantity from quantities that vary in direct or inverse proportion	Set up and solve equations where y is inversely proportional to the cube of x	Set up and use equations to solve more complex word problems involving direct and inverse proportion
Ratio, proportion and rates of change	Direct and indirect proportion						Recognise graphs showing constant rates of change, average rates of change and variable rates of change	Use algebraic methods to solve problems involving variables in direct proportion	Set up equations to show direct proportion	Use expressions of the form $y \alpha x^2$	Set up and use equations to solve word and other problems involving direct or inverse proportion		
Ratio, proportion and rates of change	Direct and indirect proportion							Use expressions of the form $y \alpha x$	Use expressions of the form $y \alpha 1/x$		Solve problems involving inverse proportion using graphs by plotting and reading values from graphs		
Ratio, proportion and rates of change	Direct and indirect proportion							Write the equation of a straight line graph where the variables are in direct proportion		Recognise graphs showing direct or inverse proportion	Solve problems involving inverse proportionality, including problems where y is inversely proportional to the square of x		
Ratio, proportion and rates of change	Fraction notation			Use fraction notation to describe parts of shapes	Express one number as a fraction of another	Use a ratio to find one quantity when the other is known	Understand the relationship between fractions and ratios, write fractions as ratios and ratios as fractions						
Ratio, proportion and rates of change	Fraction notation				Express the division of a quantity into a number of parts as a ratio	Use fraction notation to express a smaller whole number as a fraction of a larger one							
Ratio, proportion and rates of change	Fractions			Know how many unit fractions in a whole	Identify equivalent fractions								
Ratio, proportion and rates of change	Fractions				Know how many unit fractions in an improper fraction or mixed number where the unit fraction has the same								

Ratio, proportion and rates of change	Graphs							Use a conversion graph to convert between units	Draw a real life linear graph given information about speed and time			Recognise sketch and interpret graphs of exponential functions $y = k^x$ for positive values of k and integer values of x	
Ratio, proportion and rates of change	Graphs								Use graphs to calculate measures including unit price, average speed, distance, time, acceleration				
Ratio, proportion and rates of change	Growth and decay							Represent repeated proportional change using a multiplier raised to a power	Calculate repeated proportional change	Use percentages in real-life situations: compound interest, depreciation, percentage profit and loss			
Ratio, proportion and rates of change	Growth and decay							Use calculators to explore exponential growth and decay					
Ratio, proportion and rates of change	Growth and decay							Use compound interest					
Ratio, proportion and rates of change	Identifying					Use proportional reasoning to solve a problem		Understand direct proportion as equality of ratios		Identify direct proportion from a table of values by comparing ratios of values			
Ratio, proportion and rates of change	Measurement					Solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 decimal places where appropriate. Example: 4000 ml = 4 L, 0.36 m = 36 cm, 450 g = 0.45 kg		Begin to convert between miles and kilometres. Example: 5 miles = 8 km, 45 miles = 72 km, 180 miles = 288 km					
Ratio, proportion and rates of change	Measurement					Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3 decimal places Example: 1991 m = 1991 km, 650 ml = 0.65 L, 0.073 kg = 73 g							
Ratio, proportion and rates of change	Multiplicative reasoning							Use measures in ratio and proportion problems (currency conversion, rates of pay, best value)					
Ratio, proportion and rates of change	Multiplicative relationships							Express a multiplicative relationship between two quantities as a ratio or a fraction					
Ratio, proportion and rates of change	Percentages	Convert a percentage to a number of hundredths or tenths		Define percentages as number of parts per hundred	Express one given number as a percentage of another	Express one quantity as a percentage of another	Compare two quantities using percentages, including a range of calculations and contexts	Use the unitary method for an inverse operation, e.g. If I know an item was 80% of the original cost in a sale, find the original price	Find the original amount given the final amount after a percentage change (reverse percentages)		Find the original amount after repeated percentage change		
Ratio, proportion and rates of change	Percentages			Recognise the equivalence of percentages, fractions and decimals	Find a percentage of a quantity using a multiplier	Find the outcome of a given percentage decrease	Solve problems involving percentage change		Use calculators for reverse percentage calculations by doing an appropriate division				
Ratio, proportion and rates of change	Percentages				Interpret percentage and percentage change as a fraction or a decimal	Find the outcome of a given percentage increase	Use a multiplier to increase or decrease by a percentage						
Ratio, proportion and rates of change	Percentages				Recall equivalent fractions, decimals and percentages, including for fractions that are greater than 1; match across all three types, using simple fractions (1/2, 1/4, 1/5, 1/10)	Use percentages greater than 100%	Use a unitary method to find a percentage, e.g. if £40 is 60%, find 1% by dividing by 60 and then 100% by multiplying by 100; give them the scaffolding to answer the question						
Ratio, proportion and rates of change	Percentages				Use percentages to compare simple proportions	Use strategies for finding equivalent fractions, decimals and percentages involving decimal percentages and decimals greater than 0	Use percentages in real-life situations: VAT, value of profit or loss, simple interest, income tax calculations						
Ratio, proportion and rates of change	Ratio						Solve problems involving simple ratios, i.e. unequal sharing and grouping using knowledge of fractions and multiples. Example: The ratio of blue tiles to orange tiles is 3:5. There are 16 tiles altogether. How many are orange?			Solving multi-step problems involving ratio and percentages			
Ratio, proportion and rates of change	Scale diagrams		Read and construct scale drawings	Draw lines and shapes to scale			Use and interpret maps, using proper map scales (1 : 25 000)	Use and interpret scale drawings, where scales use mixed units, and drawings aren't done on squared paper, but have measurements marked on them					
Ratio, proportion and rates of change	Scale diagrams			Estimate length using a scale diagram									
Ratio, proportion and rates of change	Scale diagrams			Use and interpret maps and scale drawings, using a variety of scales									
Ratio, proportion and rates of change	Similarity							Know that enlargements of 2D shapes produce similar shapes	Enlarge 2D shapes and recognise the similarity of resulting shapes		Calculate the new area of a shape after enlargement	Find points that divide a line in a given ratio, using the properties of similar triangles	Calculate the new volume of a shape after enlargement
Ratio, proportion and rates of change	Similarity								Identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments				
Ratio, proportion and rates of change	Similarity								Understand that the ratio of any two sides is constant in similar right-angled triangles				
Ratio, proportion and rates of change	Similarity								Understand the implications of enlargement for perimeter				
Ratio, proportion and rates of change	Simplifying ratio				Reduce a ratio to its simplest form	Reduce ratios to their simplest form, including three-part ratios	Simplify a ratio expressed in fractions or decimals	Simplify a ratio expressed in different units					
Ratio, proportion and rates of change	Simplifying ratio				Use ratio notation			Write ratios in the form 1: m or m: 1					