Key Stage One (year 1 and 2)

These are the skills that children need to learn to make progress:

a.   generate and explore ideas and strategies, pursue lines of mathematical enquiry and apply logic and reasoning to mathematical problems
b.   make and test generalisations, identify patterns and appreciate equivalences and relationships
c.   develop, select and apply a range of mental, written and ICT-based methods and models to estimate, approximate, calculate, classify, quantify, order and compare
d.   communicate ideas and justify arguments using mathematical symbols, diagrams, images and language
e.   interpret findings, evaluate methods and check outcomes.

		Which skills are the children learning?	What Core Knowledge will the children acquire? Y1	What Core Knowledge will the children acquire? Y2	How will we know if this has been successful?
KS1	Number	1. to estimate the number of objects and count them, recognising conservation of number 2. to read, write and order numbers to 100 and beyond using a range of representations 3. to explore and explain patterns, including number sequences in the counting system 4. to group, match, sort, partition and recombine numbers, developing an understanding of place value	• count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number • count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens • given a number, identify one more and one less • identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least • read and write numbers from 1 to 20 in numerals and words.	• count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward • recognise the place value of each digit in a two-digit number (tens, ones) • identify, represent and estimate numbers using different representations, including the number line • compare and order numbers from 0 up to 100; use <, > and = signs • read and write numbers to at least 100 in numerals and in words • use place value and number facts to solve problems.	- Give the children three digit cards, including 0, for example: 3 6 0 What numbers can you make, using two or three of these digits? Write down each number you make. Read those numbers to me. Can you write the largest of the numbers in words? - Which of your numbers are odd and which are even? How do you know? - [Show number cards for 19 and 91.] Which of these numbers is nineteen? How do you know? - What does the other one say? How are they the same/different? - How many tens are there in 60? Use this to partition the number 67. Show me two other ways you might partition this number.

Calculation	5. a range of strategies for combining, partitioning, grouping and sharing (including doubling and halving) and increasing and decreasing numbers, to solve practical problems 6. to use number bonds to ten to add and subtract mentally whole numbers with one or two significant figures 7. to represent addition and subtraction as number sentences including finding missing numbers and understanding the equals sign 8. to use coins of different values and recognise the equivalence of different combinations of coins 9. to compare and order costs of different items	• read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs • represent and use number bonds and related subtraction facts within 20 • add and subtract one-digit and two-digit numbers to 20, including zero • solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = - 9. • solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. • recognise, find and name a half as one of two equal parts of an object, shape or quantity • recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.	• solve problems with addition and subtraction: • using concrete objects and pictorial representations, including those involving numbers, quantities and measures • applying their increasing knowledge of mental and written methods • recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones a two-digit number and tens two two-digit numbers adding three one-digit numbers • show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot • recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. • recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs • show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot • solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. • recognise, find, name and write fractions 1/3, 1/4, 2/4 and 3/4 of a length, shape, set of objects or quantity • write simple fractions e.g. 1/2 of 6 = 3 and recognise the equivalence of 2/4 and 1/2.	- What information did you use to solve the problem? - How did you decide which calculations to do? - Could you have solved it in a different way? - How is your method different from Judi's method? - What is 48 + 5? How did you work it out? What is 48 + 50? How did you work this out? How do you know that the answer is not 53? Could you write something or use apparatus to help you explain? - What number goes in the box to make this calculation correct? ·· ÷ 2 = 7 How do you know? - Can you make three different number sentences using 16, 7 and 23 with = and any of the four operation symbols? - Can you change the three numbers to make this into a different problem for someone else to solve? How will you know if their answer is correct?

Measures	10. to compare and order objects and events 11. to create and use whole number scales to measure	• compare, describe and solve practical problems for: • lengths and heights (e.g. long/short, longer/shorter, tall/short, double/half) • mass or weight (e.g. heavy/light, heavier than, lighter than) • capacity/volume (full/empty, more than, less than, quarter) • time (quicker, slower, earlier, later) • measure and begin to record the following: lengths and heights mass/weight capacity and volume time (hours, minutes, seconds) • recognise and know the value of different denominations of coins and notes • sequence events in chronological order using language such as: before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening • recognise and use language relating to dates, including days of the week, weeks, months and years • tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.	• choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels • compare and order lengths, mass, volume/capacity and record the results using >, < and = • recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value • find different combinations of coins that equal the same amounts of money • solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change • compare and sequence intervals of time • tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.	Point out something that you think is about two metres high/tall/long. What can you see that you think is just shorter/longer than a metre? Which containers do you think will hold just a little more than a litre? On the graph, how do you work out the numbers between the labels? Which way of getting to school was used by 7 children? These labels show only 0, 2, 4, 6, 8 and 10. How could you find 7? If this scale carried on, what other numbers do you think would be shown? Would the number 34 be shown? How can you tell?
Shape	12. to identify, group, match, sort and compare common shapes using geometric properties 13. to identify, reproduce and generate geometric patterns including the use of practical resources and ICT 14. to generate instructions for straight and turning movement	• recognise and name common 2-D and 3-D shapes, including: • 2-D shapes (e.g. rectangles (including squares), circles and triangles) • 3-D shapes (e.g. cuboids (including cubes), pyramids and spheres). • describe position, directions and movements, including half, quarter and three-quarter turns.	• identify and describe the properties of 2-D shapes, including the number of sides and symmetry in a vertical line • identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces • identify 2-D shapes on the surface of 3-D shapes, for example a circle on a cylinder and a triangle on a pyramid • compare and sort common 2-D and 3-D shapes and everyday objects • order and arrange combinations of mathematical objects in patterns • use mathematical vocabulary to describe position, direction and movement including distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise), and movement in a straight line.	- Describe the shape or solid in the cloth bag as you feel it. What might it be? Why? How do you know this shape is a ...? How do you know this shape isn't a ...? - Imagine a cube. Four faces are yellow; the rest are blue. How many faces are blue? - Describe this shape/solid to a friend. Can they guess what it is? - Sort these 2-D shapes. Put all the pentagons in this circle. Now choose another way to sort them. What do all the shapes that you have put in the circle have in common? - Two of these shapes have no lines of symmetry. Which are they?
Data	15. to generate and explore questions that require the collection and analysis of information 16. to collect, group, match, sort, record and represent information (i) for a purpose and store it using ICT 17. to interpret and draw conclusions from information they have collected	• Answer a question by recording information in lists and tables; present outcomes using practical resources, pictures, block graphs or pictograms • Use lists, tables and diagrams to sort objects; explain choices using appropriate language, including 'not'	• interpret and construct simple pictograms, tally charts, block diagrams and simple tables • ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity • ask and answer questions about totalling and comparing categorical data.	How could you make the table? What headings do you need? How could you make the list? Would it help to put the information in order? Which of these ways of presenting the information helps us best to answer the question? Why is a block graph a good way of showing your results? What does the tallest column of blocks mean? How did the block graph help you to answer the question?

How will the children be enabled to do this? 'Breadth of Learning'

During the year, pupils should be taught the knowledge, skills and understanding through:
a. practical activity, exploration and discussion
b. using mathematical ideas in practical activities, then recording these using objects, pictures, diagrams, words, numbers and symbols
c. using mental images of numbers and their relationships to support the development of mental calculation strategies
d. estimating, drawing and measuring in a range of practical contexts
e. drawing inferences from data in practical activities
f. exploring and using a variety of resources and materials, including ICT
g. activities that encourage them to make connections between number work and other aspects of their work in mathematics.

Lower Key Stage 2 (year 3 and 4)

These are the skills that children need to learn to make progress:

f.   generate and explore ideas and strategies, pursue lines of mathematical enquiry and apply logic and reasoning to mathematical problems
g.   make and test generalisations, identify patterns and appreciate equivalences and relationships
h.   develop, select and apply a range of mental, written and ICT-based methods and models to estimate, approximate, calculate, classify, quantify, order and compare
i.   communicate ideas and justify arguments using mathematical symbols, diagrams, images and language
j.   interpret findings, evaluate methods and check outcomes.

		Which skills are the children learning?	What Core Knowledge will the children acquire? Y3	What Core Knowledge will the children acquire? Y4	How will we know if this has been successful?
LKS2	Number	1. to use decimals up to three decimal places in measurement contexts 2. to understand and use the equivalence of families of fractions and their decimal representation when ordering and comparing 3. to explore number patterns and properties, and represent them using graphs, simple formulae and ICT 4. about the development of the number system 5. to interpret computer and calculator displays and round to an appropriate level of accuracy	• count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number • recognise the place value of each digit in a three-digit number (hundreds, tens, ones) • compare and order numbers up to 1000 • identify, represent and estimate numbers using different representations • read and write numbers up to 1000 in numerals and in words • solve number problems and practical problems involving these ideas.	• count in multiples of 6, 7, 9, 25 and 1000 • find 1000 more or less than a given number • count backwards through zero to include negative numbers • recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) • order and compare numbers beyond 1000 • identify, represent and estimate numbers using different representations • round any number to the nearest 10, 100 or 1000 • solve number and practical problems that involve all of the above and with increasingly large positive numbers • read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.	- Count back in twos from six. - Show me seven hops of two forwards from negative five on the number line. - What numbers could go in the boxes to make these correct? □ + ◇ < 20 30 > □ - ◇ - Write a statement using two negative numbers and the 'greater than' symbol. Write a statement using a positive number and a negative number and the 'less than' symbol. - What does the digit 7 represent in each of these numbers: 3.7, 7.3, 0.37, 3.07? - What if I put a pound sign in front of each of these numbers? - What if they are all lengths given in metres? Write these lengths in order: 47 cm, 1.14 m, 3.6 m, 250 cm, 0.85 m. Which is the shortest? How do you know? Which is the longest? How do you know? - Enter 5.3 on to your calculator display. How can you change this to 5.9 in one step (operation)? - A CD costs between £5.50 and £5.65. How much could it cost? I am nearly 1.65 m tall. How tall could I be? - Roughly, what answer do you expect to get? How did you arrive at that estimate? - Is this calculation correct? How do you know?

Calculation	

6. to compare two numbers by finding the difference between them

7. to use the relationship between addition and subtraction and addition and multiplication to understand and generate equivalent expressions

8. to use simple fractions to find fractional parts and express proportions

9. to select from a range of mental strategies for the addition and subtraction of numbers with two significant figures

10. to understand division as grouping and as sharing and solve division problems using multiplication facts

11. to visualise and understand multiplication represented as an array, record multiplication as number sentences and solve problems using multiplication facts

12. to use estimation to find approximate answers to calculations, to record calculations and check answers and methods

13. to record amounts of money using pounds and/or pence, converting between them as appropriate

14. how to handle amounts of money in the contexts of shopping, saving up and enterprise activities | • add and subtract numbers mentally, including:
a three-digit number and ones
a three-digit number and tens
a three-digit number and hundreds
• add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
• estimate the answer to a calculation and use inverse operations to check answers
• solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.
• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
• write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
• solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects.
• count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
• recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
• recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
• recognise and show, using diagrams, equivalent fractions with small denominators
• add and subtract fractions with the same denominator within one whole (e.g. 5/7 + 1/7 = 6/7)
• compare and order unit fractions, and fractions with the same denominators
• solve problems that involve all of the above. | • add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
• estimate and use inverse operations to check answers to a calculation
• solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.
• recall multiplication and division facts for multiplication tables up to 12 × 12
• use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
• recognise and use factor pairs and commutativity in mental calculations
• multiply two-digit and three-digit numbers by a one-digit number using formal written layout
• solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.
• recognise and show, using diagrams, families of common equivalent fractions
• count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten
• solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
• add and subtract fractions with the same denominator
• recognise and write decimal equivalents of any number of tenths or hundredths
• recognise and write decimal equivalents to 1/4; 1/2; ¾
• find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths
• round decimals with one decimal place to the nearest whole number
• compare numbers with the same number of decimal places up to two decimal places
• solve simple measure and money problems involving fractions and decimals to two decimal places. | - What are the important things to remember when you solve a word problem?

- Explain what you did to get your answer.

- How did you know whether to add, subtract, multiply or divide? What clues did you look for in the problem?

- Show me how you recorded any calculations you needed to do to solve the problem.

- Did you have to do anything to your answer to make it fit with the problem? Tell me what you did.

- Work out 56 + 27. Explain what you did. What did you notice about the numbers that helped you choose how to do it? Repeat with other calculations.

- The product is 36. What two numbers have been multiplied together?

- If 7 × 8 = 56, what is 7 × 9?

- Give me an example of a two-digit by one-digit multiplication you could do mentally. Give me an example of a similar multiplication where you would use a written method.

- Describe a problem that will give you a remainder that you will need to round up.

- What is the largest remainder you can have when you divide by 6?
- Two of these shapes have three quarters shaded. Point to them. Explain how you know.
- Tell me some fractions that are greater than 1/2. How do you know? What about fractions that are greater than 1? |

Measures	15 to recognise when length and capacity are conserved 16. to use standard units to estimate measures and to measure with appropriate accuracy 17. to recognise and use equivalent representations of time 18. to measure angles using fractions of turn and right angles 19. to explore the development of different measuring systems, including metric and imperial measures	• measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) • measure the perimeter of simple 2-D shapes • add and subtract amounts of money to give change, using both £ and p in practical contexts • tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks • estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight • know the number of seconds in a minute and the number of days in each month, year and leap year • compare durations of events, for example to calculate the time taken by particular events or tasks.	• Convert between different units of measure (e.g. kilometre to metre; hour to minute) • measure and calculate the perimeter of a rectilinear figure(including squares) in centimetres and metres • find the area of rectilinear shapes by counting squares • estimate, compare and calculate different measures, including money in pounds and pence • read, write and convert time between analogue and digital 12 and 24-hour clocks • solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.	- Estimate the capacity of this washing-up bowl. And of this bottle. - Choose the correct answer. A drinking glass holds about… 0.2 litres 2 litres 20 litres 200 litres - What unit would you use to measure the capacity of a watering can? Of an oil tank? Of a coffee cup? - Can you tell me another way to say or write 6 litres? What about 750 millilitres? - Look at these cards. They have weights in grams or kilograms. 5 kg, 500 g, 1/4 kg, 1.5 kg, 750 g Put the cards in order from the lightest to the heaviest. How did you order the cards? Why did you put this measurement here? - Harry, Eve and Khalid measured the same objects. Here are Harry's measurements. pencil length − 16 cm computer screen width − 33 cm door width − 77 cm cube length − 1.9 cm ruler width − 3.8 cm room length − 830 cm Eve wrote her measurements in millimetres. What did she write? Khalid wrote his measurements in metres. What did he write? What would you use? Would you use different units for different measurements? Why or why not?
Shape/Geometry/Position	20. to recognise symmetry properties of 2D shapes and patterns 21. to make simple scalings of objects and drawings 22. to understand and use angle as the measure of turn 23. to understand perimeter as a length and to find the perimeter of rectangles and other shapes 24. to create sequences of instructions using ICT, including generating symmetric and repeating geometric patterns	• draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them • recognise that angles are a property of shape or a description of a turn • identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle • identify horizontal and vertical lines and pairs of perpendicular and parallel lines.	• compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes • identify acute and obtuse angles and compare and order angles up to two right angles by size • identify lines of symmetry in 2-D shapes presented in different orientations • complete a simple symmetric figure with respect to a specific line of symmetry. • describe positions on a 2-D grid as coordinates in the first quadrant • describe movements between positions as translations of a given unit to the left/right and up/down • plot specified points and draw sides to complete a given polygon.	- Match these 3-D shapes to these pictures of them. - There are three shapes in a row. What order are they in and what colour are they? Clues: • The cube is in the middle. • The pink shape is not on the right. • The red shape is next to the pyramid. • The cone is not blue. - A shape has four right angles. It has four sides which are not all the same length. What is the name of this shape?

Data/Statistics	25. to collect and structure information using ICT so that it can be searched and analysed, including using appropriate field headings and data types 26. to use frequency diagrams and bar charts to represent and record information 27. to interpret their own and others' data	• interpret and present data using bar charts, pictograms and tables • solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables.	• interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs • solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.	- What are you trying to find out? What information are you aiming to collect? How? - Why have you chosen to collect that information? What will it tell you? - Imagine that the class is going to organise a tea party for parents. What information would you need to find out? What are the simplest ways that you can find the information? - What information will you need to collect to answer your question? How will you collect it?

How will the children be enabled to do this? 'Breadth of Learning'

During the year, pupils should be taught the knowledge, skills and understanding through:
a. practical activity, exploration and discussion
b. using mathematical ideas in practical activities, then recording these using objects, pictures, diagrams, words, numbers and symbols
c. using mental images of numbers and their relationships to support the development of mental calculation strategies
d. estimating, drawing and measuring in a range of practical contexts
e. drawing inferences from data in practical activities
f. exploring and using a variety of resources and materials, including ICT
g. activities that encourage them to make connections between number work and other aspects of their work in mathematics.

Upper Key Stage 2 (year 5 and 6)

These are the skills that children need to learn to make progress:

k.	generate and explore ideas and strategies, pursue lines of mathematical enquiry and apply logic and reasoning to mathematical problems
l.	make and test generalisations, identify patterns and appreciate equivalences and relationships
m.	develop, select and apply a range of mental, written and ICT-based methods and models to estimate, approximate, calculate, classify, quantify, order and compare
n.	communicate ideas and justify arguments using mathematical symbols, diagrams, images and language
o.	interpret findings, evaluate methods and check outcomes.

		Which skills are the children learning?	What Core Knowledge will the children acquire? Y5	What Core Knowledge will the children acquire? Y6	How will we know if this has been successful?
UKS2	Number	1. to understand and interpret negative numbers, simple fractions, large numbers and tenths, written as decimals, in practical and everyday contexts 2. to generate and explore a range of number patterns, including multiples 3. to make and test general statements about numbers, sort and classify numbers and explain methods and findings 4. to approximate numbers, including rounding, and understand when that can be useful 5. about the representation of number in different contemporary cultures	• read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit • count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 • interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero • round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 • solve number problems and practical problems that involve all of the above • read Roman numerals to 1000 (M) and recognise years written in Roman numerals.	• read, write, order and compare numbers up to 10 000 000 and determine the value of each digit • round any whole number to a required degree of accuracy • use negative numbers in context, and calculate intervals across zero • solve number and practical problems that involve all of the above.	- The rule for this sequence of numbers is 'add 3 each time'. 1, 4, 7, 10, 13, 16 … The sequence continues in the same way. I think that no matter how far you go there will never be a multiple of 3 in the sequence. Am I correct? Explain how you know. What is the value of 4X + 7 when X = 5? Explain how you know. - Write a number in the box to make this correct. 0.627 = 0.6 + 0.02 + □ - What number is exactly halfway between 1.1 and 1.2? - Which of these numbers is closest in value to 0.1? 0.01 0.05 0.11 0.2 0.9 How can you tell? - Tell me a number with two/three decimal places that rounds to 5.0 when rounded to the nearest tenth. - I added three odd numbers and my answer was 50. Explain why I cannot be correct. - Roughly, what answer do you expect to get? How did you arrive at that estimate? - Is this calculation correct? How do you know? What inverse operation could you use to check this result? - Should the answer be a multiple of 3? How could you check?

Calculation			
6. to use proportional reasoning to compare numbers and quantities and solve problems 7. to extend their knowledge of multiplication facts to 10×10 and use them to solve multiplication and division problems 8. to understand and use different models of division, including interpreting the outcome of a division calculation, in relation to the context, where the answer is not a whole number 9. to recognise and use the relationship between fractions and division and represent division as number sentences 10. to recognise and use the relationships between addition, subtraction, multiplication and division 11. to develop a range of strategies including mental and written ones, for calculating and checking, including using a calculator or computer efficiently 12. to solve multi-step problems involving more than one operation 13. to solve problems related to borrowing, spending and saving 14. to understand and convert between different currencies 15. how to manage money and prepare budgets for events, including using spreadsheets	• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. • identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. • solve problems involving multiplication and division where larger numbers are used by decomposing them into their factors • know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • establish whether a number up to 100 is prime and recall prime numbers up to 19 • multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers • multiply and divide numbers mentally drawing upon known facts • divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context • multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 • recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3) • solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. • compare and order fractions whose denominators are all multiples of the same number • identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths • recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. 2/5 + 4/5 = 6/5 = 11/5) • add and subtract fractions with the same denominator and multiples of the same number • multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams • read and write decimal numbers as fractions (e.g. 0.71 = 71/100) • recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents • round decimals with two decimal places to the nearest whole number and to one decimal place • read, write, order and compare numbers with up to three decimal places • solve problems involving number up to three decimal places • recognise the per cent symbol (%) and understand that	• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • perform mental calculations, including with mixed operations and large numbers. • identify common factors, common multiples and prime numbers • use their knowledge of the order of operations to carry out calculations involving the four operations • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. • multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • use common factors to simplify fractions; use common multiples to express fractions in the same denomination • compare and order fractions, including fractions >1 • add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions • multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. 1/4 × 1/2 = 1/8) • divide proper fractions by whole numbers (e.g. 1/3 ÷ 2 = 1/6) • associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. 3/8) • identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places • multiply one-digit numbers with up to two decimal places by whole numbers • use written division methods in cases where the answer has up to two decimal places • solve problems which require answers to be rounded to specified degrees of accuracy • recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.	- Look at these calculations with two-digit decimals. Tell me how you could work them out in your head. What other method could you use? - Two numbers have a difference of 1.583 and one of the numbers is 4.728. What is the other? Is this the only answer? - Look at these calculations. Which of them is incorrect? Why? 12.4 × 6.6 = 71.23 48.6 ÷ 3 = 16.2 - Work out 32.75 − 1.837. Explain each step to me. - What tips would you give to someone to help with long multiplication of HTU × TU? - What are important things to remember when you solve word problems? - What clues do you look for in the wording of questions? What words mean you need to add, subtract, multiply or divide? - Make up two different word problems for each of these calculations. Try to use a variety of words. (17 + 5) × 6 12.5 ÷ 5 − 0.25 - Make up a question involving addition that has the answer 1.35. Now try subtraction. What about multiplication? Division? - How can you use factors to multiply 17 by 12? - Which of these subtractions can you do without writing anything down? Why is it possible to solve this one mentally? What clues did you look for? What is the answer to the one that can be solved mentally? - Printing charges for a book are 3p per page and 75p for the cover. I paid £4.35 to get this book printed. Work out on your calculator how many pages there are in the book. Write down the calculations that you did. - Seeds are £1.45 for a packet. I have £10 to spend on seeds. What is the greatest number of packets I can buy? Show me how you used your calculator to find the answer.

				RATIO AND PROPORTION	- Six cakes cost one pound eighty. How much do ten cakes cost?
				• solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts • solve problems involving the calculation of percentages (e.g. of measures) such as 15% of 360 and the use of percentages for comparison • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. **ALGEBRA** • express missing number problems algebraically • use simple formulae expressed in words • generate and describe linear number sequences • find pairs of numbers that satisfy number sentences involving two unknowns • enumerate all possibilities of combinations of two variables.	- Here is part of a number line. Write the two missing numbers in the boxes. - In a country dance there are 3 boys and 2 girls in every line. 42 boys take part in the dance. How many girls take part? For a different dance there are 45 children. How many boys are there? - How would you change an amount of money from pounds sterling to euros? Record it for me, using symbols.
	Measures	16. to recognise when area, volume and mass are conserved 17. to convert between units within the metric system 18. to use an angle measurer to measure angles in degrees 19. to solve problems involving time and time intervals, including time represented by the 24-hour clock 20. to use decimal calculations to solve problems with measures	• convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) • understand and use equivalences between metric units and common imperial units such as inches, pounds and pints • measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres • calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes • estimate volume (e.g. using 1 cm3 blocks to build cubes and cuboids) and capacity (e.g. using water) • solve problems involving converting between units of time • use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling.	• solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate • use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places • convert between miles and kilometres • recognise that shapes with the same areas can have different perimeters and vice versa • recognise when it is possible to use formulae for area and volume of shapes • calculate the area of parallelograms and triangles • calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm3) and cubic metres (m3), and extending to other units such as mm3 and km3.	- Solve this problem: A bottle holds 1 litre of lemonade. Rachel fills 5 glasses with lemonade. She puts 150 millilitres in each glass. How much lemonade is left in the bottle? - Now write a question of your own that would involve converting units. - This graph converts miles to kilometres. Use it to estimate a distance of 95 miles in kilometres. - Give me an example of when: you would need an accurate measure of length; you would be able to use a less-accurate recording. - What is the most accurate measure of length you can make with the equipment in our classroom? Explain why.

Shape/Geometry/Position	21. to use and make maps, scale models and diagrams for a purpose 22. to understand area as the space enclosed by a perimeter on a plane, and find areas of rectangles and related shapes 23. to solve practical problems involving 3D objects 24. to visualise geometric objects38 and to recognise and make 2D representations of 3D shapes 25. to create and refine sequences of instructions, using ICT to construct and explore geometric patterns and problems 26. to explore aspects of geometry to find out about its origins, and its use in different cultures, religions, art and architecture	• identify 3-D shapes, including cubes and other cuboids, from 2-D representations • know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles • draw given angles, and measure them in degrees (o) • identify: angles at a point and one whole turn (total 360o) angles at a point on a straight line and ½ a turn (total 180o) other multiples of 90o • use the properties of rectangles to deduce related facts and find missing lengths and angles • distinguish between regular and irregular polygons based on reasoning about equal sides and angles. • identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.	• draw 2-D shapes using given dimensions and angles • recognise, describe and build simple 3-D shapes, including making nets • compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons • illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius • recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. • describe positions on the full coordinate grid (all four quadrants) • draw and translate simple shapes on the coordinate plane, and reflect them in the axes.	- Imagine a triangular prism. How many faces does it have? Are any of the faces parallel to each other? - How many pairs of parallel edges has a square-based pyramid? How many perpendicular edges? - Look at these 3-D shapes (e.g. a cuboid, tetrahedron, square-based pyramid and octahedron). Show me a face that is parallel to this one. Which face is perpendicular to this one? - What can you tell me about the faces of a cuboid? Why are so many packing boxes made in the shape of a cuboid? - Which of these shapes is incorrectly placed on this Carroll diagram? Change the criteria so the shapes are correctly sorted according to their properties. - Use your ruler and protractor. Draw the net of a regular tetrahedron with edges of 6 cm. - Use compasses to draw a circle. Use a ruler and protractor to draw a regular pentagon with its vertices on the circumference of the circle. - Tell me an example of a circular object that would have a radius of about 5 cm. What about 50 cm? 500 cm?

	27. how statistics are used in society today 28. to use different kinds of averages and range to summarise and compare data sets 29. to use data to assess likelihood and risk and develop an understanding of probability through computer simulations, games and consideration of outcomes of everyday situations 30. to discuss, sort and order events according to their likelihood of occurring 31. to answer questions or test hypotheses by using ICT to collect, store, analyse and present data 32. to use ICT to represent data on a scattergraph, and proportional data in a pie chart in order to explore possible relationships and interpret' the findings	• solve comparison, sum and difference problems using information presented in a line graph • complete, read and interpret information in tables, including timetables.	• interpret and construct pie charts and line graphs and use these to solve problems • calculate and interpret the mean as an average.	- Give children some statements to consider: - It is hotter now than it was 30 years ago. The local high street should be made pedestrian only. The tombola makes the most money at the summer fete. - Turn these statements into questions that you could investigate. Suggest a plan for finding out whether the statements are true or false. - [Show graphs with the title, labels on the axes and intervals hidden.] What could this graph represent? If so, what would these labels be? How would this scale be numbered? State three conclusions you can draw from the information in this graph. - Here is a bar chart showing rainfall. Kim says: 'The dotted line on the chart shows the mean rainfall for the four months.' Use the chart to explain why Kim cannot be correct. - Use the information in the graph below and a calculator to work out how many pounds (£) you would get for 24.80 euros.

Data/Statistics

How will the children be enabled to do this? 'Breadth of Learning'
During the year, pupils should be taught the knowledge, skills and understanding through: a. practical activity, exploration and discussion b. using mathematical ideas in practical activities, then recording these using objects, pictures, diagrams, words, numbers and symbols c. using mental images of numbers and their relationships to support the development of mental calculation strategies d. estimating, drawing and measuring in a range of practical contexts e. drawing inferences from data in practical activities f. exploring and using a variety of resources and materials, including ICT g. activities that encourage them to make connections between number work and other aspects of their work in mathematics.