FOREST PREPARATORY SCHOOL

ANIMO ET FIDE

Forest Preparatory School

Calculations Policy

bellevue

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Checked by: Deputy Head and all class teachers

The CPA Approach

Concrete, Pictorial, Abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils.

At a glance:

- An essential technique of maths mastery that builds on a child's existing understanding
- A highly effective framework for progressing pupils to abstract concepts like fractions
- Involves concrete materials and pictorial/representational diagrams
- Based on research by psychologist Jerome Bruner
- Along with bar modelling and number bonds, it is an essential maths mastery strategy

Concrete step of CPA

Concrete is the "doing" stage. During this stage, children use concrete objects to model problems. Unlike traditional maths teaching methods, where teachers demonstrate how to solve a problem, the CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects. With the CPA framework, every abstract concept is first introduced using physical, interactive concrete materials.

Pictorial step of CPA

Pictorial is the "seeing" stage. Here, visual representations of concrete objects are used to model problems. This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.
Building or drawing a model makes it easier for children to grasp difficult abstract concepts (for example, fractions). Simply put, it helps students visualise abstract problems and make them more accessible.

Abstract step of CPA

Abstract is the "symbolic" stage, where children use abstract symbols to model problems. Children will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem. The abstract stage involves the teacher introducing abstract concepts (for example, mathematical symbols). Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols to indicate addition, subtraction, multiplication or division.

NB: Whilst this is a guide for what is taught generically in each year group, it is worth noting that different children progress at different stages, therefore you may find your child is covering material listed across a couple of year groups, dependent on individual progression. This is always done at teacher discretion, to ensure all children are being given the opportunity to master the fundamentals before applying their knowledge to a given context. Class work is always differentiated, according to need, and there is always 'challenge' available for all abilities.

Maths online learning portals

Numbots (Reception - Year 2)

At Forest, we have invested in the understanding, recall and fluency of your child's mental arithmetic skills by subscribing to numbots.

Your child will have their own personal log in and be assigned different mental arithmetic games by their class teacher.

Times Tables Rock Stars (Year 2-6)

TTRS boosts maths confidence and increases fluency and recall in multiplication and division, delivering better maths outcomes.

Your child will have their own personal log in and their class teacher will assign different multiplication and division activities.

Other useful links:

Please find a list of useful maths websites the teachers use in school:

Topmarks (can be filtered by age)
ICT Games (clear links to curriculum, mainly Y1-3)
Maths Frame (free versions of some games available)
Maths Games (filter by year group 1-6)
BBC Bitesize
Nrich (good for developing problem solving skills)

Early Years Foundation Stage

It is widely appreciated that a child's mathematical understanding is greatly influenced during their early years of life. At Forest Preparatory, we strive to ensure that children's first experiences of mathematics within school are both positive and practical. During these early years, children are given opportunities to develop and improve their skills in counting, understanding and using numbers, calculating simple addition and subtraction problems; and to describe shapes, spaces, and measures.

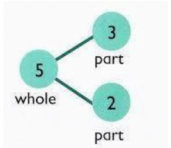
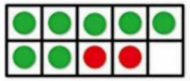
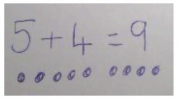
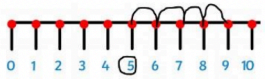
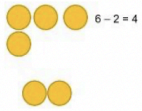
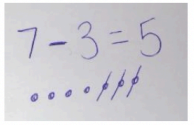
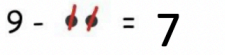
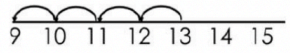
	Addition		*Subtraction*
Key language	**Add More than Altogether Total**	**Equal The Same**	**Subtract Less than Take away Fewer**
Early Learning Goals	● Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. ● Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. ● They solve problems, including doubling, halving and sharing. ● Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. ● They recognise, create and describe patterns. ● They explore characteristics of everyday objects and shapes and use mathematical language to describe them.		

Children need to understand…	• Rote counting to 10 and then progressing to 20. • Understanding quantity, recognition of numbers. • Matching number to quantity (increments of 5, up to 20). All will explore adding one more and some will explore one less throughout their EYFS years. • Adding two small sets. • More and fewer terminology. • Subitising- looking at a group of objects to estimate quantity.
Equipment we use	➢ Chromebook- for interactive online games ➢ A variety of child friendly resources e.g. dinosaurs, cars, teddy bears ➢ Number lines ➢ Tens Frames ➢ Some will use hundred squares
How we teach it	**Nursery and Kindergarten focus:** concrete numbers. Using physical objects to show what it means to be a given quantity e.g. 5 teddy bears. Being able to count a given number of objects. Recognising a number and correctly associating it with a given amount of objects e.g. 5 cars can be matched to the number 5. Adding small concrete sets of objects. Correct number formation. **Reception focus:** still using the concrete approach to adding two small sets, or even just one more, with numbers up to 20. This will lead to exploring subtraction in more detail; what it actually means; one less; the concept of taking away a quantity from a larger number, with the answer being less.

	Gradually, this will continue with larger numbers and transition to an increasingly pictorial approach. Once this concept has been grasped, children will be introduced to the more abstract approach of understanding how to write number sentences and what they mean. Huge focus on embedding terminology and understanding what it means: add/total, subtract/difference, equals/the same.

Year 1

	Addition	*Subtraction*
Key Language	**Add Plus More Altogether Sum Total** **tens/ones**	**Subtract Minus Less Take away Fewer Difference** **tens/ones**
National Curriculum Objectives	● 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 0 ● Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? − 9	
Children need to understand…	● Rote counting, forwards and backwards, building on from Reception to larger numbers. ● Solid understanding of numbers and place value (tens and ones) and ordering numbers according to size. ● Two digit numbers can be partitioned into the number of tens and number of ones. ● The concept of equality, then with calculations written on either side of the = sign. ● Count and combine groups (aggregation) to find the total/how many altogether. ● That addition can be done in any order but that subtraction cannot be done in any order as we need to begin with the biggest number (whole). ● When two parts are added together it is equal to the whole.	

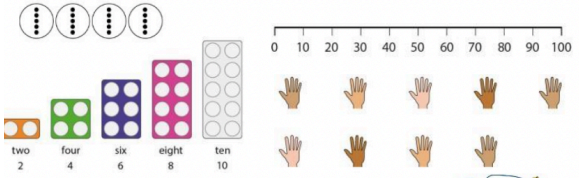
	• A whole, minus a part, is equal to a part.
Equipment we use	Chromebooks Number Line Hundred square Counters Multilink Numicon
How we teach it	  3 + 2 = 5 2 + 3 = 5 5 = 3 + 2 5= 2 + 5  4 + 3 = 7  7+2=9 Children can draw both parts and count to find the whole.  Counting on (Augmentation) To understand that we can count on from the biggest number. 5 + 4   Missing numbers need to be placed in all possible places. ***Written***: Using a number line, children will count 'how many jumps' when adding two numbers together, always starting with the bigger number. Once they have grasped this, they will start to understand that addition can be done with either number at the start, as the answer will always be the same. Children are encouraged to circle  With equipment physically taking away from a group. Count out the whole, take away a part. What part is left?  Using pictures to crossing out to a given part to find what is left. 4 – 2 = 2 Draw the whole and minus the part by crossing out and counting what is left.   5-3=2 5-2=3 2=5-3 3=5-2 Counting back from a given number. To understand that we can count back the smaller number starting at the biggest number.  13-4 = 9  Children understand that it is ***always*** the bigger number which a smaller number is being subtracted from. Once secure, this can progress to experimenting moving the numbers in the calculation around, so that the calculation still makes sense:

	their starting number, so not to include this as a 'jump'. ***Mental***: Children learn to 'catch' the bigger number in their head and count on the smaller number, initially using fingers, then progressing to number lines/ hundred squares. There is a heavy focus on the concrete and pictorial approach, as the children work with larger numbers, to consolidate their understanding, and then they transition to a more abstract approach. Emphasis on language and synonyms for the different terms.	5 -3 = 2 2 = 5 - 3

	Multiplication	*Division*
Key Language	**Array**: *an arrangement of objects, pictures, or numbers in rows and columns.* **Repeated addition** **Lots of/groups of**	**Groups of** **Equal** **The same** **Shared**
National Curriculum Objectives	• 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.	
Children need to understand…	• Securely, the order and value of numbers. • The value of coins (as multiplication of 2's,5's and 10's is often linked to money). • What the term 'sharing' means and it has to be into **equal** groups. • Children begin to understand what happens when we share into equal groups of increasing value.	
Equipment we use	Coins 100 square Child-friendly objects (including sweets!) Numicon	

How we teach it

Children learn how to skip count in/count in groups of 2s, 5s, and 10s using a range of pictorial representations. (Forwards and backwards)

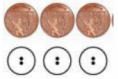


Children use equipment to move objects to make equal groups of 2s, 5s, and 10s and begin to develop an understanding of arrays.

Children to use pictorial representations to circle equal groups of 2s, 5s, and 10s.

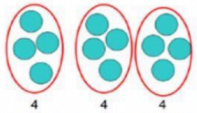
Children use coins/number lines/pictures to find the total of equal groups by counting in 2, 5 and 10. Children are able to describe equal groups using words.

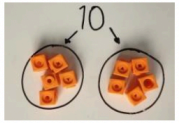
Three equal groups of 2 is equal to 6.



<u>Sharing (partitive division)</u>
12 blue balls are shared equally between my 3 friends. How many blue balls do they get each?

Children share the items amongst the 3 groups. Then count how many is in each group.
12 shared equally between 3 is 4.

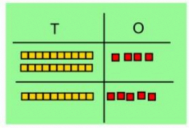
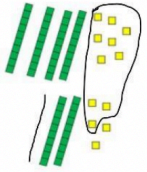
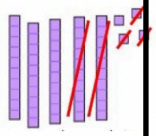
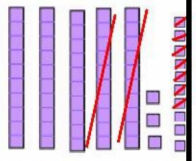


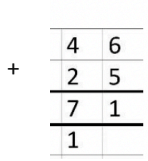


Children develop their understanding of finding a half of a set of objects by sharing into 2 equal group.

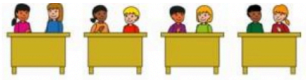
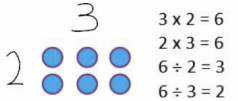
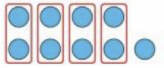
Year 2

	Addition	*Subtraction*
Key language	**Add Plus More Altogether Sum Total Tens Ones** **Regrouping**: rearranging numbers into groups by place value to make it easier to carry out operations.	**Subtract Minus Less Take away Fewer Difference Tens Ones** **Exchanging**: representing a number in a different format and in a different place value column to assist the calculation. 'Stealing' from one column to use in another.
National Curriculum Objectives	● Using concrete objects and pictorial representations, including those involving numbers, quantities and measures ● Apply 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 1s - a two-digit number and 10s - 2 two-digit numbers - adding 3 one-digit numbers ● Show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot. ● Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.	

Children need to understand…	• Adding can be done using concrete objects AND pictorial representations to add TO + TO. • Place value of numbers to 100 and addition of multiples of 10 using a variety of equipment- numicon, PV counters, dienes, 10p and 1p coins. • The relationship between each digit. E.g 10 ones are equal to 1 ten, therefore 12 ones is 1 ten and 2 ones. • Part plus a part is equal to the whole. • Connection between addition and subtraction, inverse. • Some move on to regrouping.
Equipment we use	Chromebooks Money Multilink cubes Counters Number lines Hundred square
How we teach it	 No regrouping 24 + 15=39 Numbers to be placed underneath each other. Make each addend using equipment. Add together the ones first then add the tens. Regrouping Where the ones sum 10 or more we need to regroup. Regroup 10 ones for on ten. 47 + 25 =72 Numbers to be placed underneath each other. Make each addend using equipment. Add together the ones. When the sum of the ones is equal to ten or more we must regroup. Draw a circle to show ten ones. Draw the regrouped ten into the then column. Add the tens.  Sums with no regrouping (ie. where adding two sets of
	No exchange- first use equipment to physically subtract, then children to draw in books using crossing out to represent being taken away. Make the whole, subtract the part, what part is left? 54- 23=31  With exchange use equipment to physically subtract, then children to draw in books using crossing out to represent being taken away. Where you cannot physically take the ones away from the biggest number you must exchange 1 ten for 10 ones. -Make the whole, -subtract the part, if you can't subtract the ones exchange 1 ten 54-17=31 for 10 ones, then subtract the part -what part is left?  Some children will progress to the more abstract method

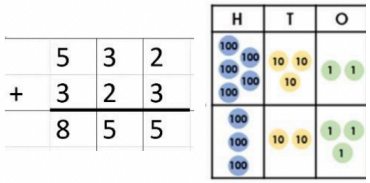
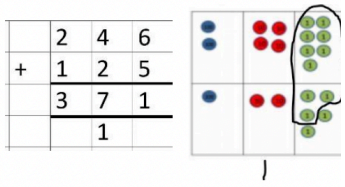
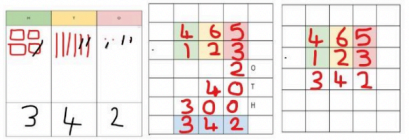
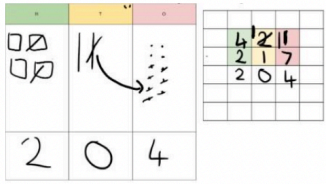
	ones/units does not exceed 9) are focused upon first, to ensure children are secure in their method and understanding. Once children are secure, they will be introduced to addition with regrouping, using concrete and pictorial representations initially and then moving on to abstract column addition.  When regrouping in column addition, the ten regrouped is placed at the bottom, **underneath** the equals lines to remind the child to include later in the sum.	of subtraction (see Year 3), depending on security in pictorial representation.

	Multiplication	*Division*
Key Language	**Multiply Array Times Groups of Lots of Repeated Addition Product**	**Groups of Equal The same Shared Divisible by**
National Curriculum Objectives	• 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 2 numbers can be done in any order (commutative) and division of 1 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.	
Children need to understand…	• Pupils use a variety of language to describe multiplication and division. • Pupils are introduced to the multiplication tables. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations. • Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example, 40 ÷ 2 = 20, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, 4 × 5 = 20 and 20 ÷ 5 = 4).	

	• Repeated addition, concept of leading to multiplication knowledge.	
Equipment we use	Chromebook Hundred square Cubes Money	
How we teach it	Children will begin to represent equally grouped objects as both repeated addition and multiplication. Group size + group size + group size Number of groups x group size is equal to the product.   2 + 2 + 2 + 2 *'There are four groups of two.'* *'There are two and two and two and two.'* *'We can write this as two plus two plus two plus two.'* *We can also write this as 4 times 2. 4 x 2*  Children will use equipment/drawings of arrays represent multiplication and develop the understanding of commutativity. *4 + 4 + 4 + 4 + 4 = 20* *5 + 5 + 5 + 5 = 20* *4 × 5 = 20 and 5 × 4 = 20* There are five equal groups of cakes. There are three cakes in each group. There are five groups of three. Arrays are very useful in helping children visualise the calculation, bridging the gap between pictorial and abstract approaches.	Grouping (quotitive division) I have 12 stars. How many groups of 4 can I make?  There are 3 groups of 4 in 12. 12 ÷ 4 = 3 Children collect the dividend and group by the number in the divisor. They count how many groups there are altogether to work out the quotient. Children make and draw arrays to help them divide. 15 ÷ 3 = 5 there are 5 groups of 3 in 15. Children draw groups of 3 until they get to 15. They then count how many groups.  Children begin to understand that division is the inverse of multiplication and it is not commutative. Children use arrays to support this.   Children using place value counters and drawings learn that numbers don't always group equally and can have a remainder 9 is divided into groups of 2 with a remainder of 1. 9 ÷ 2 = 4 r1 Once secure in meaning, children will be introduced to the bus stop method without remainders (see Year 3).

Year 3

	Addition	*Subtraction*
Key language	**Add Plus More Altogether Sum Total Tens Ones Regrouping**	**Subtract Minus Less Take away Fewer Difference Hundreds Tens Ones Exchanging Stealing**
National Curriculum Objectives	• Add and subtract numbers mentally, including: - a three-digit number and 1s - a three-digit number and 10s - a three-digit number and 100s • Add and subtract numbers with up to 3 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.	
Children need to understand…	• Place value of numbers to 1000 and addition of multiples of 100. • The relationship between each digit. e.g 10 tens are equal to 1 hundred, 12 tens is 1 hundred and 2 tens, which is written as 120. • Partitioning tens and ones/units, in the expanded method.	

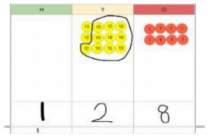
How we teach it	No regrouping Numbers to be placed underneath each other. Make/write each addend. Add together the ones first then add the tens.  Regrouping When the sum of the ones column is equal to ten or more we must regroup. Children need to be able to regroup the ones and tens columns. Numbers to be placed underneath each other. Make/write each addend. Add together the ones. If the sum of column is ten or more we must regroup. Regroup ten ones for 1 ten. Carry the ten under the answer line in the tens column. Then add the tens. Then add the hundreds.  	Introduce mathematical terms for subtraction Minuend (whole) minus the subtrahend (part) is equal to the difference (part). Initial use of expanded subtraction alongside the short subtraction. Physically take away with equipment or cross out in drawing. No exchange- equipment and drawing alongside abstract written method. Make the minuend Subtract the ones Subtract the tens Subtract the hundreds What is the difference?  With exchange of ones and tens column- equipment and drawing alongside abstract written method. When the ones or tens in the subtrahend is less than the ones/tens in the minuend, we need to exchange from the column on the left. Make the minuend Subtract the ones (is the subtrahend ones less than the minuend ones?) Subtract the tens (is the subtrahend tens less than the minuend tens?) Subtract the hundreds What is the difference?  Once children are secure in the abstract method with no exchanging, they are introduced to 'exchanging'. When exchanging in column subtraction, the exchanged number is placed in the column before, at the top, next to the other number (see above).
Equipment	Number lines Hundred square Cubes (for some)	

	Multiplication	*Division*
Key Language	**Multiply Array Times Groups of Lots of Repeated Addition Product**	**Groups of Equal The same Shared Divisible by**
National Curriculum Objectives	• 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 positive integer scaling problems and correspondence problems in which n objects are connected to m objects.	
Children need to understand…	• Place value columns • Bus stop, without remainders to begin with and then with. • Grid method to show understanding of partitioning then moving onto formal method, O X TO	
Equipment we use	Whiteboards, tables charts	

How we teach it

1. Grid method

Children use equipment or drawing alongside the abstract to partition a two-digit number into tens and ones then multiplying the parts by the single- digit number then add the partial products.



37 x 5 =

X	30	7
5	150	35

37 x 5 = 150 + 35

37 x 5 = 185

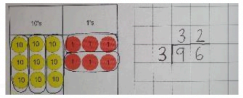
Children need to have a really secure knowledge of numbers for this method, as they are expected to be able to partition independently.

2. Expanded column method

Children use their knowledge of arrays to represent the multiplying of the parts.
Regrouping where necessary.
When the sum of a column equals ten or more we must regroup.
The multiplicand representing the number of groups 32 x 4 = 4 x 2 and 4 x 30
Children alongside equipment and drawings to record as expanded multiplication.
- multiplicand multiply the ones
-Find the product
- multiplicand multiply the tens -find the product.
-find the total of the products.

Children to continue to develop their understanding of division as grouping, including remainders. Children to use arrays, place value counters, drawings and bar modelling to support this.

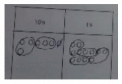
Children use their knowledge of partitioning to divide a 2 digit number where the tens and ones are multiples of the divisor (no exchange). Children use equipment, drawings alongside the short method.
96 ÷ 3=
How many groups of 3 go into 96
Write the divisor 3, draw the frame, write the dividend 96, now divide.
Starting with the tens
first 9 tens ÷ 3 is 3 tens.
write '3 in the tens above the ones.

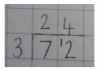


quotient
divisor | dividend

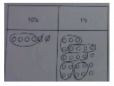
column 6 ones ÷ 3 is 2 ones. record

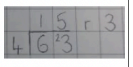
When the tens is not a multiple of the divisor (exchange)
Starting with the tens, 7 tens ÷ 3 is 2 tens remainder 1 ten, write 2 in the tens column and exchange the remainder: 1 ten for ten ones: write the 1 to the left of the ones digit of the dividend to make 12 ones.
12 ones ÷ 3 is 4 ones, Write the 4 ones in the ones column.





When a calculation involves exchanging tens for ones but gives an overall remainder.
Starting with the tens, 6 tens ÷ 4 is 1 ten and remainder of 2 tens, write 2 in the tens column and exchange the remainder: 1 ten for ten ones: write the 2 to the left of the ones digit of the dividend to make 23 ones.
23 ones ÷ 4 is 5 ones and a remainder of 3 ones.
Write the 5 ones in the ones column and remainder 3





Include examples where the tens digit of the dividend is smaller than the divisor, to show that the calculation reduces to division of the entire 2 digit number, as ones, by the divisor, and so short division is not helpful.

	Fractions
Key language	**Tenth** **Equal parts** **Denominator** **Numerator** **Equivalent**
National Curriculum Objectives	• 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 [for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$] • Compare and order unit fractions, and fractions with the same denominators • Solve problems that involve all of the above
Children need to understand…	A fraction is an equal part of a whole A fraction can be converted into a decimal
Equipment used	Fraction boxes, pizza pictures, games

How we teach it	Folding paper into halves,quarters, eighths, looking at pictures of shapes divided into fractions (5ths and 20ths, Colouring unit and non unit fractions Finding a fraction a group of objects

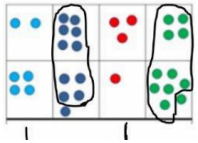
Year 4

	Addition	*Subtraction*
Key language	**Add Plus More Altogether Sum Total Tens Ones Regrouping**	**Subtract Minus Less Take away Fewer Difference Hundreds Tens Ones Exchanging Stealing Big brother**
National Curriculum Objectives	• 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.	
Children need to understand…	• Securely, the place value of numbers to 10,000 and addition of multiples of 100. • The relationship between thousands, tens of thousands. e.g. 10 hundreds are equal to 1 thousand, 12 hundred is equal to 1 thousand and 2 hundred, written as 1200. • Inverse means 'opposite' and that addition is the inverse of subtraction (and vice versa) and multiplication is the inverse of division (and vice versa). • Exchanging in subtraction is 'stealing' from one column, to use in another in order for the calculation to be carried out in the abstract method.	
Equipment used	Learning walls, whiteboards, ITPs	

How we teach it

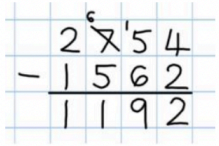
Children should be using a short formal written method of columnar addition see year 3. Children should use equipment, pictorial and drawings where appropriate alongside the abstract, to support understanding of addition with and without regrouping.

	2	6	3	4
+	4	5	1	7
	7	1	5	1
	1		1	



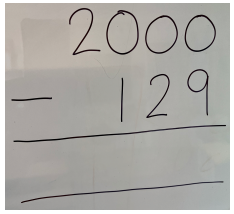
From Year 4 onwards, a 'c' in a circle denotes where children have used inverse in their written method to check their answer.

Children should be using a short formal written method of columnar subtraction-see year 3. Children should use equipment and drawings alongside the abstract written method where appropriate, to support understanding of subtraction without and with exchange of the ones, tens and hundreds column.

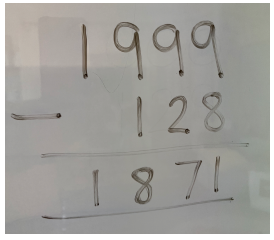


Exchanging of hundreds and tens to assist calculation.

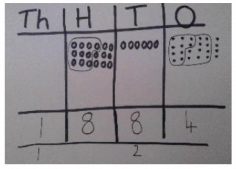
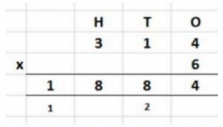
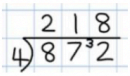
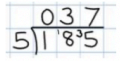
Top trick: when the larger number has multiple zeros, the calculation is changed (subtracting one from both parts of the question) to equal the same answer. This saves a lot of exchanging/ stealing!

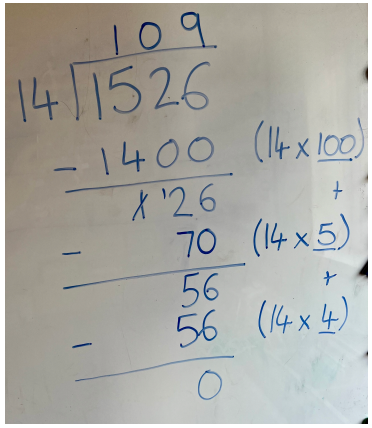


becomes…



	Multiplication	*Division*
Key Language	**Multiply Array Times Groups of Lots of Repeated Addition Product Grid Turtlehead short method**	**Groups of Equal The same Shared Divisible by Chunks Divisor Quotient Bus stop How many (chin touch)**
National Curriculum Objectives	• 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 3 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 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.	
Children need to understand…	• Place value knowledge of four digit numbers. • Secure multiplication recall (up to 12 times table). • What happens to numbers when they are multiplied by 10, 100 and 1000.	
Equipment we use	Grid method to start TO X O, TO X TO then short formal method Short formal method for multiplying decimals e.g. circling the numbers after the decimal point to ensure same in answer, 100 squares, times table squares & PV mats	

How we teach it	Children use their knowledge of arrays and place value to represent the multiplying of the parts. Multiplicand representing the number of groups.   Children alongside equipment/drawings, record as expanded multiplication before moving onto short multiplication- regrouping where necessary. *When the sum of a column equals ten or more we must regroup.* - Multiplicand multiply the ones -Find the product - Multiplicand multiply the tens -Find the product. - Multiplicand multiply the hundreds -Find the product -What is the total of the products.  Children continue with an expanded method of multiplication (see Year 3) until secure, moving on to the short multiplication method, where they use regrouping (as above).	Children to use short division to divide a 3-digit number by a 1 digit number- without exchange, with exchange of the hundreds and tens column- including remainders. Use of drawing and equipment alongside the written method.   Where the dividend digit is not divisible by the divisor, it should be recorded as 0 and exchanged into the next column.
		Some will progress on to dividing by a two-digit number. The written method children are introduced to here is 'chunking'. Just as multiplication is repeated addition, division is explored in this method.

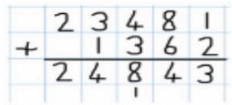
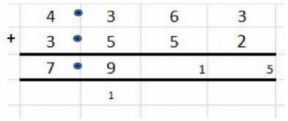
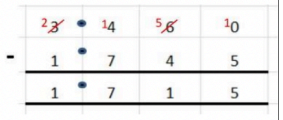
		 Here, 'chunks' of known multiples of the divisor are subtracted away from the dividend, until no more can be subtracted. The 'chunks' are then added together to give the answer (quotient).

	Fractions
Key language	**Tenth** **Equal parts** **Denominator** **Numerator** **Equivalent**
National Curriculum Objectives	• 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 100 and dividing tenths by 10 • 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 hundreds • Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ • 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 ones, tenths and hundredths • Round decimals with 1 decimal place to the nearest whole number • Compare numbers with the same number of decimal places up to 2 decimal places • Solve simple measure and money problems involving fractions and decimals to 2 decimal places
Children need to understand…	• A fraction is a piece of something • Fractions are another way of thinking about division • Fractions can be converted into decimal numbers and percentages

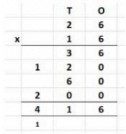
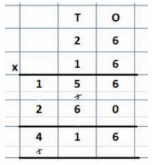
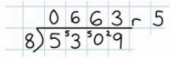
Equipment used	ITPs/Fraction walls/playdough/loop games/bead stick
How we teach it	Start with making pieces, move onto what makes a fraction (Elvis song), next is shading fractions, fractions of amounts, simplify and then converting. Many of these skills will be applied during word problems and/or reasoning.

Year 5

	Addition	*Subtraction*
Key language	**Add Plus More Altogether Sum Total Tens Ones Regrouping**	**Subtract Minus Less Take away Fewer Difference Hundreds Tens Ones Exchanging Stealing**
National Curriculum Objectives	• 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.	
Children need to understand…	• Securely, the place value of numbers to 1,000,000. • The relationship between tens of thousands, hundreds of thousands and millions. • The place value of decimal numbers. • Adapt methods to calculate efficiently and effectively with decimals. • Compare and contrast methods.	

How we teach it		
	Children should be using a short formal written method of columnar addition-see year 3. Children should use equipment, pictorial and drawings where appropriate alongside the abstract, to support understanding of addition with and without regrouping.  Children need secure understanding of the relationships with tenths, hundreds and thousandths. Secure understanding of 0 as a place holder. The decimal point should be aligned in the same way as the other place value columns, and must remain in the same column in the answer row.  	Children should be using a short formal written method of columnar subtraction-see year 3/4. Children should use equipment where appropriate to support the understanding of subtraction without and with exchange of the ones, tens and hundreds, thousands, tens of thousands, hundreds of thousands and millions column. Subtraction of decimals see expectations in addition.  

	Multiplication	*Division*
Key Language	**Multiply Array Times Groups of Lots of Repeated Addition Product**	**Groups of Equal The same Shared Divisible by Chunks Divisor Quotient**
National Curriculum Objectives	• Identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers. • 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 1,000. • Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}). • Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes. • 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.	
Children need to understand…	Develop methods to multiply by single and double digit numbers. Short and long multiplication Develop column methods with an understanding of place value and continue to use the key skill of utilising to multiply and divide by 10,100 and 1000. Written division methods by single and 2-digit numbers	

	Division and multiplication of fractions.	
Equipment we use	White boards Jotters	
How we teach it	Children use equipment and drawing to partition partitioning the multiplicand (two digit number). then multiplying each digit in the multiplier (up to 4 digits). Then adding the partial products to find the total product- regrouping where necessary. Children need to continue to develop their understanding as 0 as a place holder.  Using expanded multiplication children understand the process of partitioning the multiplicand and multiplying it by each digit in the multiplier.  Children continue this process by using long multiplication. Emphasis on when regrouping is required, it needs to be crossed out when recombined. -find the first product by multiplying the ones digit in the multiplicand by each digit in the multiplier. Regrouping where necessary. -Finding the second product by multiplying the tens digit in the multiplicand by each digit in the multiplier. Regrouping where necessary. -Find the total product by adding the 2 products together.	Children learn about the effect on a number when it is divided by 10, 100 and 1000 and have secure understand of what the 0 represents after division. Secure children's understanding of dividing with and without exchange of a 3-digit number by a 1-digit number using short division. (See same process as year 3 but with added hundred columns.) Children to use short division to divide a 4-digit number by a 1-digit number- without exchange, with exchange of the thousand, hundreds and tens column- including remainders. Use of drawing and equipment alongside the written method.  Where the dividend digit is not divisible by the divisor, it should be recorded as 0 and exchanged into the next column.

	Fractions, Decimals and Percentages
Key language	**Tenth** **Equal parts** **Denominator** **Numerator** **Equivalent**
National Curriculum Objectives	• 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 [for example, $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$] • Add and subtract fractions with the same denominator, and denominators that are 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 [for example, 0.71 = $\frac{71}{100}$] • Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents • Round decimals with 2 decimal places to the nearest whole number and to 1 decimal place • Read, write, order and compare numbers with up to 3 decimal places • Solve problems involving number up to 3 decimal places • Recognise the percent symbol (%) and understand that percent relates to 'number of parts per 100', and write percentages as a fraction with denominator 100, and as a decimal fraction • Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25

Children need to understand…	The relationship between fractions, decimals and percentages and how to move between them. Relationship between mixed and improper fractions.
Equipment used	
How we teach it	Please refer to the children's Maths Example Book.

Year 6

	Addition	*Subtraction*
Key language	**Add Plus More Altogether Sum Total Tens Ones Regrouping**	**Subtract Minus Less Take away Fewer Difference Hundreds Tens Ones Exchanging Stealing**
National Curriculum Objectives	• Perform mental calculations, including with mixed operations and large numbers • Use their knowledge of the order of operations to carry out calculations involving the 4 operations • Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • Solve problems involving addition and subtraction • Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy	
Children need to understand…	Children need to build on their column methods to add and subtract numbers with up to seven digits, and they adapt the methods to calculate efficiently and effectively with decimals, and place value at every stage. Children compare and contrast methods, and they select methods or jottings where appropriate and these are more likely to be efficient or accurate when compared with formal column methods Bar models are used to represent the calculations required to solve problems and may indicate where efficient methods can be chosen.	

How we teach it	Children should be using a short formal written method of columnar addition see year 3. Children should use equipment, pictorial and drawings where appropriate alongside the abstract, to support understanding of addition with and without regrouping. Children to add money, measure and decimals with different decimal points.	Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit. Secure place value of numbers to 10,000,000. Children need to be secure in the relationship between millions and tens of millions. Children to subtract money, measure and decimals with different decimal points.

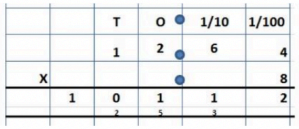
	Multiplication	*Division*
Key Language	**Multiply Array Times Groups of Lots of Repeated Addition Product**	**Groups of Equal The same Shared Divisible by Chunks Divisor Quotient**
National Curriculum Objectives	• Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal 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 • Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context • Identify common factors, common multiples and prime numbers • Solve problems involving multiplication and division • Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy	
Children need to understand…	• One square per digit (including decimals)	

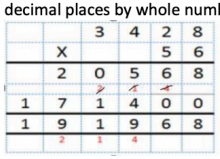
	• Decimal in middle • Number formation e.g. 4 • Short multiplication method (zero down) • Formal long written method. Remainders as a standard • Remainder as fraction Building on their understanding, children develop methods to multiply up to 4-digit numbers by single-digit numbers and 2-digit numbers. Children develop column methods with an understanding of place vale, and they continue to use the key skill of unitising to multiply and divide by 10,100 and 1000. Written division methods are introduced and adapted for division by single-digit and 2-digit numbers and are understood alongside the area model and place value. Multiplication and division of decimals are also introduced and refined in Year 6.

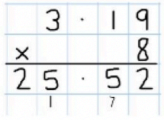
How we teach it

To continue to secure children's understanding of multiplying a 4-digit number by a 1-digit number using short multiplication and by a 2 digit using long multiplication including money and measures.

Children to multiply numbers with up to two decimal places by whole numbers.







Children need to explore division of dividends that are multiples of ten- e.g. 60 ÷ 30 and use related facts- 6 tens ÷ 3 tens = 2 'if one factor is made ten times the size, the product will be ten times.'

Spend time reviewing multiplication strategies (such as doubling, halving and place value) for calculating multiplies of a divisor with different numbers focusing on efficient methods to create a ratio chart. Explore how the dividend can be partitioned to help us answer a given question mentally.

	× 31
1	31
2	62
3	
4	124
5	155
6	
7	
8	248
9	
10	310

Using the chart alongside short division work though the calculations-up to 4 digits.
432 ÷ 31.
First write the divisor 31, the frame and the dividend 434
Divide starting with the hundreds- 4 hundreds divided by 31 is equal to zero hundreds, with a remainder of 4 hundreds, write 0 in the hundreds column and exchange the remainder: exchange 4 hundreds for 4 tens and write 4 to the left of the tens of the dividend to make 43 tens.
- 43 tens divided by 31 is equal to one ten, with a remainder of 12 tens, write 1 in the tens column and exchange the remainder- 12 tens exchanged for 120 ones: write 12 to the left of the ones digit of the dividend to make 124 ones.
124 ones divided by 31 is equal to 4 ones: write 4 in the ones column.

$$31\overline{)434} \quad 0\ 1\ 4 \quad {}^{4}3\ {}^{12}4$$

$$25\overline{)7\ {}^{7}3\ {}^{23}0} \quad 0\ 2\ 9\ \tfrac{5}{25}$$

$$25\overline{)7\ {}^{7}3\ {}^{23}0\ .\ {}^{5}0} \quad 0\ 2\ 9\ .\ 2$$

Children to begin to express remainders as fractions and decimals.

	Fractions, Decimals and Percentages
Key language	**Tenth** **Equal parts** **Denominator** **Numerator** **Equivalent**
National Curriculum Objectives	• 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 [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$] • Divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$] • Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$] • Identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places • Multiply one-digit numbers with up to 2 decimal places by whole numbers • Use written division methods in cases where the answer has up to 2 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
Children need to understand…	Written division methods are introduced and adapted for division by single-digit and 2-digit numbers and are understood alongside the area model and place value.

	In Year 6, children develop a secure understanding of how division is related to fractions. Division of decimals are also introduced and refined in Year 6. Fractions Separate- Children find fractions of amounts, multiply fractions by a whole number and by another fraction, divide a fraction by a whole number, and add and subtract fractions with different denominators. They understand- to become more confident with working with improper fractions and mixed numbers and can calculate with them. Understanding of decimals with up to 3 decimal places is built through place value and as fractions, and children calculate with decimals in the context of measure as well as in pure arithmetic. Children develop an understanding of percentages in relation to hundredths, and they understand how to work with common percentages: 50%, 25%, 10% and !%
How we teach it	Please refer to the children's Maths Example Book.