Addition

Year 1

<u>To add one digit numbers and 2 digit number to 20 including 0.</u>

<u>To understand the + and = signs</u>

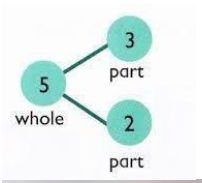
<u>To use bonds and related facts to 20.</u>

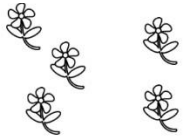
Children need to understand the concept of equality first.

Then with calculations written on either side of the = sign.

Count and combine groups (aggregation) to find the total/how many altogether.

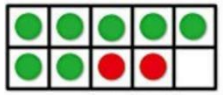
Children to begin to understand addition can be done in any order. When two parts are added together it is equal to the whole.





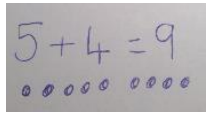
3 + 2 = 5
2 + 3 = 5
5 = 3 + 2
5= 2 + 5

4 + 3 = 7



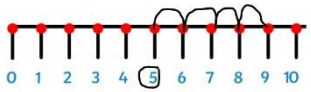
7+2=9

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



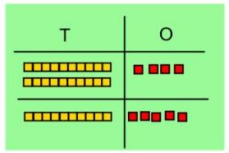
Missing numbers need to be placed in all possible places.

Year 2

<u>To add one digit/2 digit numbers to a 2 digit numbers using concrete objects and pictorial representations.</u>

<u>Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100</u>.

Add using concrete objects, pictorial representations to add TO + TO. Secure 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. Children need to be secure in 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.



<u>No regrouping</u>

24 + 15=39

Numbers to be placed underneath each other.

Make each addend using equipment.

Add together the ones first then add the tens.

<u>Regrouping</u>

Where the ones sum 10 or more we need to regroup. Regroup 10 ones for one ten.

47 + 25 =72

Numbers to be placed underneath each other.

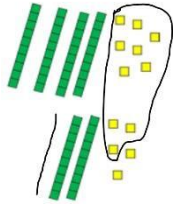
Make each addend using equipment.

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.



Year 3 <u>To add numbers with up to three digits, using formal written methods of columnar addition.</u>

Secure place value of numbers to 1000 and addition of multiples of 100.

Children need to be secure in 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.

Addend (Part) plus addend (Part) is equal to the sum (Whole)

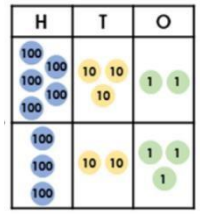
<u>No regrouping</u>

Numbers to be placed underneath each other.

Make/write each addend.

Add together the ones first then add the tens.

	5	3	2
+	3	2	3
	8	5	5



<u>Regrouping</u>

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.

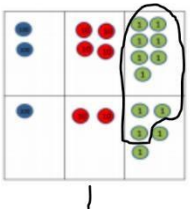
Make/write each addend.

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.

	2	4	6
+	1	2	5
	3	7	1
		1	



Year 4

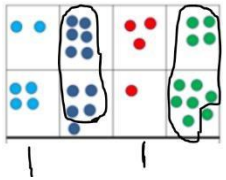
Add numbers with up to 4 digits using the formal written methods of columnar addition.

Secure place value of numbers to 10,000 and addition of multiples of 100. Children need to be secure in 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.

Addend plus addend is equal to the sum

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	

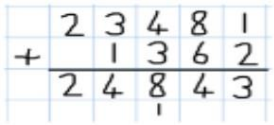


Year 5

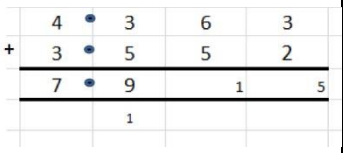
Add whole numbers with more than 4 digits, including using formal written methods.

Secure place value of numbers to 1,000,000. Children need to be secure in the relationship between tens of thousands, hundreds of thousands and millions.

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.



Year 6

To use a formal written method to add several numbers of increasing complexity.

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.

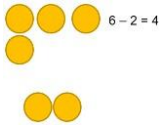
Children should be using a short formal written method of columnar addition see year 3. Children should use equipment, pictorial and drawings where appropriate alongside the abstract, to support understanding of addition with and without regrouping.

Children to add money, measure and decimals with different decimal points.

Subtraction

Year 1

<u>To subtract 1 digit numbers and 2 digit number to 20 including 0.</u>
<u>To understand the - and = signs</u>
<u>To use bonds and related facts to 20.</u>
Children need to understand the concept of equality first.
Children to begin to understand that subtraction cannot be done in any order as we need to begin with the biggest number (whole).
Whole minus a part is equal to a part.

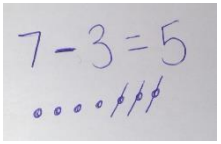


With equipment physically taking away from a group. Count out the whole, take away a part. What part is left?

Using pictures to crossing out to a given part to find what is left.

4 – 2 = 2

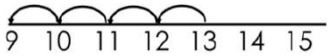
Draw the whole and minus the part by crossing out and counting what is left.



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.

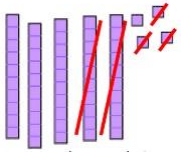
13-4 = 9



Year 2

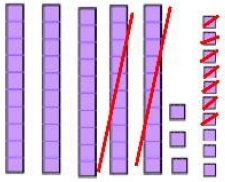
<u>To subtract one digit/2 digit numbers from a 2 digit numbers using concrete objects and pictorial representations.</u>
<u>Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100</u>.
Subtract using concrete objects and pictorial representations
Secure place value of numbers to 100 and subtraction of multiples of 10 using a variety of equipment- numicon, PV counters, dienes, 10p and 1p coins.
Children need to be secure in the relationship between each digit. E.g 10 ones are equal to 1 ten, therefore 12 ones is 1 ten and 2 ones.

<u>No exchange- first</u> 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



<u>With exchange</u> use equipment to physically subtract, then children to draw in books using crossing out to represent being taken away.

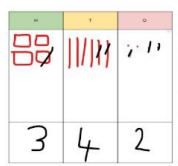
Where you cannot physically take the ones away from the biggest number you must exchange 1 ten for 10 ones. -Make the whole,
-subtract the part, if you can't subtract the ones exchange 1 ten 54-17=31 for 10 ones, then subtract the part
-what part is left?

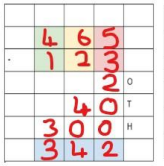


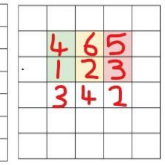
Year 3

<u>To subtract numbers with up to three digits, using formal written methods of columnar subtraction.</u>
Secure place value of numbers to 1000 and subtraction of multiples of 100.
Children need to be secure in 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.

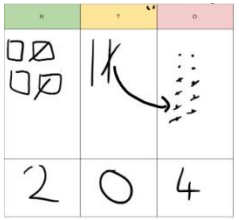
Introduce mathematical terms for subtraction
Minuend (whole) minus the subtrahend (part) is equal to the difference (part).
Initial use of expanded subtraction alongside the short subtraction.
Physically take away with equipment or cross out in drawing.
<u>No exchange</u>- equipment and drawing alongside abstract written method.
Make the minuend
Subtract the ones
Subtract the tens Subtract the hundreds
What is the difference?

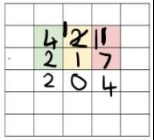


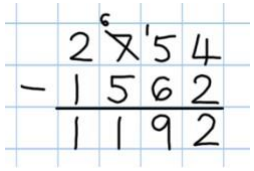
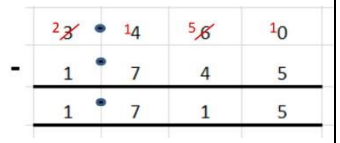




<u>With exchange of ones and tens column-</u> equipment and drawing alongside abstract written method.
When the ones or tens in the subtrahend is less than the ones/tens in the minuend, we need to exchange from the column on the left.
Make the minuend
Subtract the ones (is the subtrahend ones less than the minuend ones?)
Subtract the tens (is the subtrahend tens less than the minuend tens?) Subtract the hundreds
What is the difference?





	Year 4 Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction. Secure place value of numbers to 10,000 and subtraction of multiples of 1000. Children need to be secure in 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. Minuend minus the subtrahend is equal to the difference. 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.  	Year 5 Subtraction of whole numbers with more than 4 digits, including using formal written methods. Secure place value of numbers to 1,000,000 and the subtraction of multiples of 10,000, 100, 000 and 1,000,000. Children need to be secure in the relationship between tens of thousands, hundreds of thousands and millions. Minuend minus the subtrahend is equal to the difference. 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.   	Year 6 To use a formal written method to add several numbers of increasing complexity. 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.

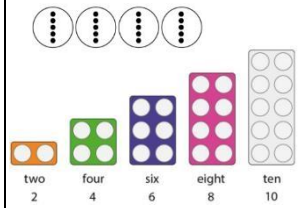
Multiplication

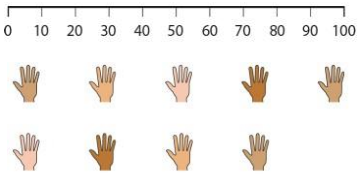
Year 1

Count in multiples of twos, fives and tens. (link to money)

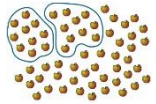
Solve one-step problems involving multiplication using concrete objects, pictorial representations and arrays with support.

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



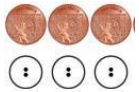


Children use equipment to move objects to make equal groups of 2s, 5s, and 10s and begin to develop an understanding of arrays.



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.

Year 2

Count in steps of 2, 3, 5 and 10s.

Recall and use multiplication facts for the 2, 5 and 10 tables.

Calculate multiplication and write them using the multiplication sign x and equals sign =. Show that multiplication can be done in any order.

Solve problems using materials, arrays, repeated addition and mental methods.

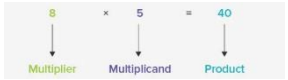
Children to continue to develop their understanding of equal groups.

Children practice identifying the number of equal groups and the size of those groups in a variety of contexts.

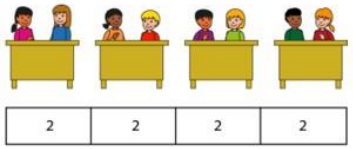
Children will begin to represent equally grouped objects as both repeated addition and multiplication.

Group size + group size + group size

Number of groups x group size is equal to the product.



4 + 4 + 4 + 4 + 4 = 20
5 + 5 + 5 + 5 = 20
4 × 5 = 20 and 5 × 4 = 20



'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.

There are five equal groups of cakes.
There are three cakes in each group.
There are five groups of three.

Year 3

Count from 0 in steps of 4, 8, 50 and 100.

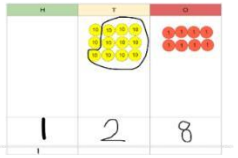
Recall and use the multiplication facts for the 3, 4 and 8 tables.

Multiply 2 digit numbers by a one-digit number progressing to a formal written method. Solve problems-missing number problems including scaling problems. Use the inverse to check answers.

Children explore the link between the 2, 4 and 8 times tables.

Children need to be secure on multiplication of a multiple of ten by a 1-digit number using known facts e.g. 5 x 2 = 10 5 x 20 = 200. Children are then able to apply the law of commutativity securely 5 x 20 = 20 x 5

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.



Children use their knowledge of arrays to represent the multiplying of the parts.

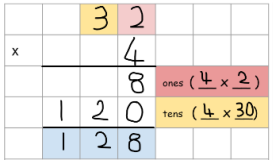
Regrouping where necessary.

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.

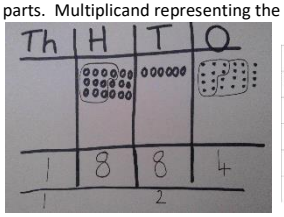


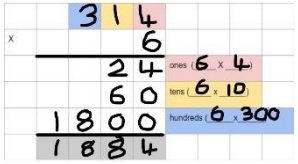
Year 4

Count in steps of 6, 7, 9, 25 and 1000.
Recall multiplication facts for up to 12 x12.
Multiply 2- digit and three digit numbers by a one-digit number using a formal written method. Solve problems involving multiplying and adding, and scaling.

Secure learning of multiplication of a multiple of hundred by a 1-digit number using known facts e.g. 5 x 2 = 10 5 x 20 = 100, 5 x 200= 1000.
Children use equipment and drawing to partition a three-digit number then multiplying the parts by the single- digit (multiplicand) then adding the partial products.

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

		H	T	O
		3	1	4
x				6
	1	8	8	4
	1		2	

-Find the product
- Multiplicand multiply the tens -Find the product.
- Multiplicand multiply the hundreds

-Find the product
-What is the total of the products.

Year 5

Count in steps of 10 up to 1,000,000
Multiply whole numbers involving decimals by 10, 100 and 1000.
Multiply 4 digit by a one digit or two-digit number- including long multiplication for 2 digit numbers.

Secure children's learning in multiplying a 4-digit number by a 1 digit number using short method (see year 4). Taking attention to the thousands multiplied by a one digit using known facts e.g. 5 x 2 = 10 5 x 20 = 100, 5 x 200= 1000, 5 x 2000 = 10000

Children need to be able to multiply O, H, T, TH by a multiple of 10 e.g. 5 x 40= 200, 50 x 40 =2000, 500 x 40=20000

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.

	T	O
	2	6
x	1	6
	3	6
1	2	0
	6	0
2	0	0
4	1	6
1		

Using expanded multiplication children understand the process of partitioning the multiplicand and multiplying it by each digit in the multiplier.

		T	O
		2	6
x		1	6
	1	5	6
	2	6	0
	4	1	6

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.

Year 6

Multiply multi digit numbers up to 4 digits by a two-digit whole number using a formal written method.

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.

		T	O	1/10	1/100
		1	2	6	4
x					8
	1	0	1	1	2
		2	5	3	

		3	4	2	8
	x			5	6
	2	0	5	6	8
1	7	1	4	0	0
1	9	1	9	6	8
	2	1	4		

		3	·	1	9
x					8
2	5	·	5	2	
	1		1		

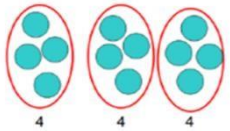
Division

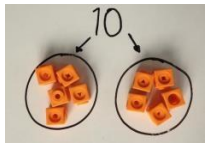
Year 1 solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Through sharing small quantities, pupils begin to understand division.

Sharing (partitive division)
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.

Children begin to understand what happens where we share by 1 or 0.

Year 2 recall and use division facts for the 2, 5 and 10 multiplication tables. calculate for division statements using the (÷) and equals (=) signs.
Begin to understand that division is not commutative and is the inverse of multiplication. Solve problems involving division.

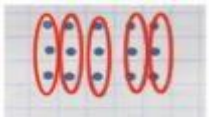
Children continue to secure their understanding of division through sharing small quantities.
Children begin to understand that we can also divide by grouping.
Children are introduced to the division symbol and begin to understand what each number represents. Secure understanding on dividing by 0 or 1.

Dividend divided by the divisor = quotient

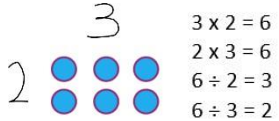
Dividing by grouping (Whole) ÷ number in groups = number of groups

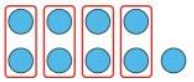
Grouping (quotitive division)
I have 12 stars. How many groups of 4 can I make?
There are 3 groups of 4 in 12.
12 ÷ 4 = 3
Children collect the dividend and group by the number in the divisor. They count how many groups there are altogether to work out the quotient.

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.



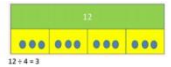


Children using place value counters and drawings learn that numbers don't always group equally and can have a remainder

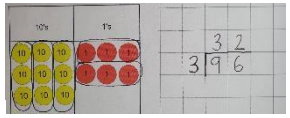
9 is divided into groups of 2 with a remainder of 1.
9 ÷ 2 = 4 r1

Year 3
recall and use division facts for the 3, 4 and 8 multiplication tables
write and calculate mathematical statements for division using the multiplication tables that they know, divide two-digit numbers by one-digit numbers, using mental and progressing to formal written methods.

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.



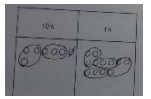
Children use their knowledge of partitioning to divide a 2 digit number where the tens and ones are multiples of the divisor (no exchange). Children use equipment, drawings alongside the short method.
96 ÷ 3=
How many groups of 3 go into 96
Write the divisor 3, draw the frame, write the dividend 96,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

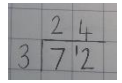


quotient
divisor | dividend

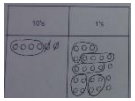
column 6 ones ÷ 3 is 2 ones. record

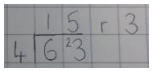
When the tens is not a multiple of the divisor (exchange)
Starting with the tens, 7 tens ÷ 3 is 2 tens remainder 1 ten, write 2 in the tens column and exchange the remainder: 1 ten for ten ones: write the 1 to the left of the ones digit of the dividend to make 12 ones.
12 ones ÷ 3 is 4 ones, Write the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



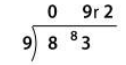


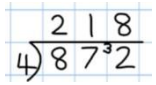
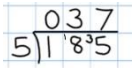
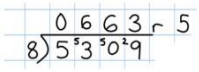
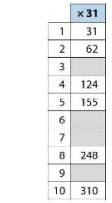
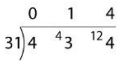
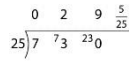
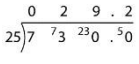
When a calculation involves exchanging tens for ones but gives an overall remainder.
Starting with the tens, 6 tens ÷ 4 is 1 ten and remainder of 2 tens, write 2 in the tens column and exchange the remainder: 1 ten for ten ones: write the 2 to the left of the ones digit of the dividend to make 23 ones.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



	Year 4 Use place value, known and derived facts to divide mentally, including: dividing by 1. Divide numbers up to 4 digits by a one-digit number using the formal written method of short division Secure children's understanding of dividing with and without exchange of a 2 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 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.	Year 5 Divide whole numbers and those involving decimals by 10, 100 and 1000. 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 including with remainders, as fractions, as decimals or by rounding (for example, 98 ÷ 4 = = 24 r 2 = 24 = 24.5 ≈ 25). 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.	Year 6 Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders as whole number remainders, fractions, or by rounding, as appropriate for the context 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. 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.     Children to begin to express remainders as fractions and decimals.