Birtley East

Calculation Policy

November 2023

Birtley East Community Primary School

Reception

Children will be encouraged to form numbers correctly. Any incorrect formations or reversals will be corrected. Teachers model simple addition and subtraction using formal notation, including use of operation and equals symbols. Children will use a range of apparatus to support their learning of addition and subtraction, including Numicon, counting objects, tens frames, number tracks, Cuisenaire rods and hundred squares. Children are encouraged to use their own pictorial recording to represent quantities and the results of simple calculations.

Children should be able to fluently recall number bonds for all numbers up to 10.

Numicon

Children will use record number patterns and calculations using the Numicon pattern.

Addition

\+ = Progressing to 5 + 4 = 9

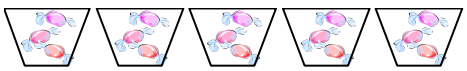
Subtraction

\- = Progressing to 9 – 5 = 4

Multiplication

Children will experience equal groups of objects and will begin to count in 2s, 10s and 5s. They will work on practical problem solving activities involving equal sets or groups.

There are 3 sweets in one bag. How many sweets are there in 5 bags?



or

Birtley East Community Primary School

Year 1

Addition and Subtraction Vocabulary	Multiplication and Division Vocabulary
+, addition, add, more, plus Make, sum, total Altogether Score Double, near double One more, two more…ten more How many to make…? How many more is… than…? How much more is…? -, subtraction, subtract, take (away), minus Leave How many are left/left over? How many are gone? One less, two less, ten less… How many fewer is…than…? How much less is…? Difference, difference between, distance between Half, halve =, equals sign, is the same as Bonds, number bonds Subtraction facts Value Size More than, less than	Multiples Grouping Sharing Double, doubling Arrays Number patterns

Do
Ensure children are confident with mental methods
Have each digit in its own square
Write the operation symbol at the left-hand side of the calculation.
Remind children to strike out digits that have been exchanged once they've been added.
Not extend the content beyond your year group.
Encourage children to use their number sense to estimate answers prior to calculations.
Consider the most efficient method of calculating.
Present calculations in different formats – horizontally, vertically, answer before question
Use a range of vocabulary to familiarise the children with the different words for the operators.
Refer to times table expectation document (see appendix) to ensure all multiplication and division calculations posed meet the expectations for the year group.
Introduce children to the symbols x , - , + and ÷

Children will record calculations horizontally. They make informal jottings for calculations. They will use a range of concrete objects to support their understanding of calculation methods before moving on to a pictorial approach. They may make use of a numbered, progressing to a blank number line to support their mental calculations. Children should be proficient in recalling number bonds for all numbers to 20. The emphasis in Year 1 is the progression in proficiency for moving from counting to calculating.

Addition and Subtraction:

Children will be able to competently partition a number in a variety of ways and use these mental strategies when performing addition and subtraction calculations. Calculations will be presented to children in different ways :

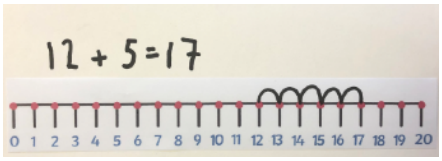
9 + 7 = ◊, ◊ = 6 + 8, 14 = ◊ + 9, 18 = 8 + ◊, 12 = 4 ◊ 8, 6 ◊ 9 = 15

9 – 3 = ◊, ◊ = 12 - 5, 11 = ◊ - 4, 8 = 15 - ◊, 12 = 15 ◊ 3, 19 ◊ 9 = 10

Children will use concrete objects as well as Numicon and Tens Frames with double-sided counters and number tracks. They will then progress to a numbered number line.

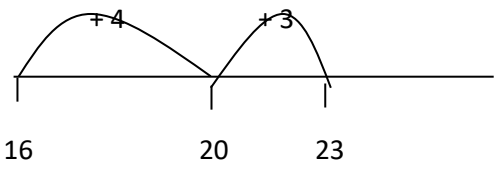
There will be a focus on mental addition and subtraction but number lines may be used to model the process..

Calculation strategies for addition using a numbered number line:

Concrete	Pictorial	Abstract
Children use knowledge of counting to 20to find a total by counting on using people or objects Start with the larger quantity and then count on the smaller number one by one to find the answer. Counting on using fingers 12 + 5 = 12 in heads, 5 on fingers and count on from 12	Start with the larger number on the number line and count on in ones or in one jump to find the answer. 	Place the larger number in your head and count on the smaller number to find the answer

Bridge through 10:

16 + 7 = 23



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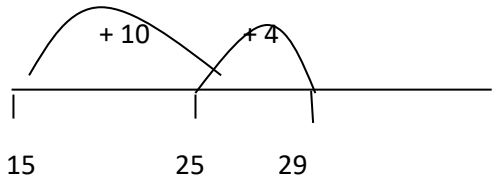
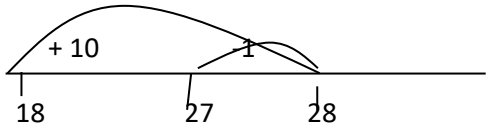
Partition when adding a two digit number:

15 + 14 = 29

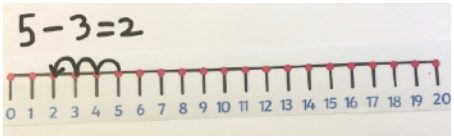


When adding a near multiple of 10, add the multiple of ten and adjust:

18 + 9 = 27

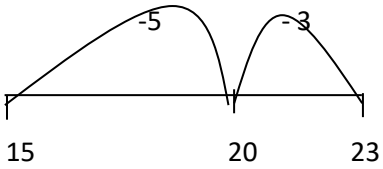


Calculation strategies for subtraction

Concrete	Pictorial	Abstract
Move objects away from the group counting backwards. 	Count back in ones using a number line. 	Children can use a number line to help. Put 13 in your head. Count back 4. What number are you at?

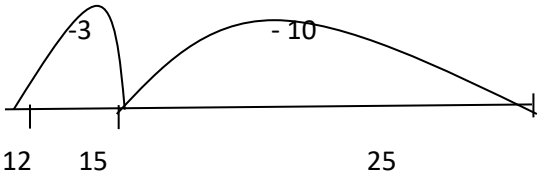
When bridging through a multiple of ten:

23 – 8 = 12



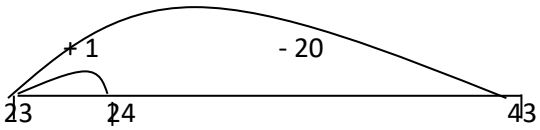
Partition when subtracting a two-digit number:

25 – 13 = 12



When subtracting a near multiple of 10, subtract the multiple of ten and adjust:

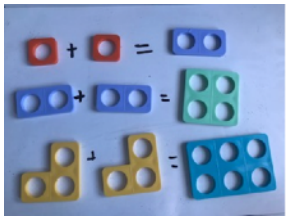
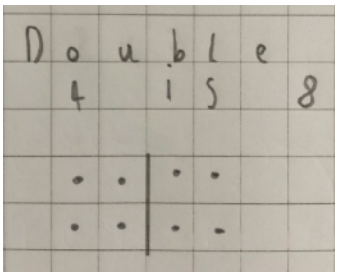
43 – 19 = 24



Multiplication and Division

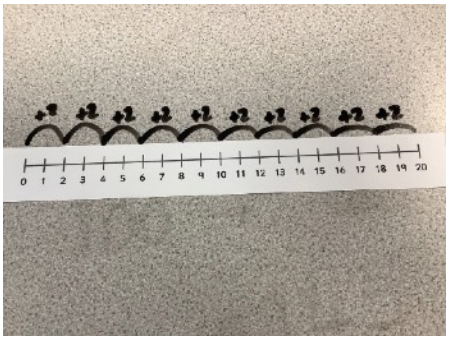
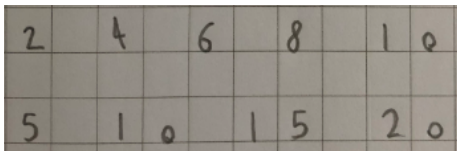
Multiplication and division will initially be taught using practical objects (Cuisenaire rods and number tracks, Numicon or counting objects). Fact families should be taught together in order to promote children's ability to recall known facts and make links between corresponding calculations. Once ready to progress to pictorial representations, children will draw arrays.

Doubling

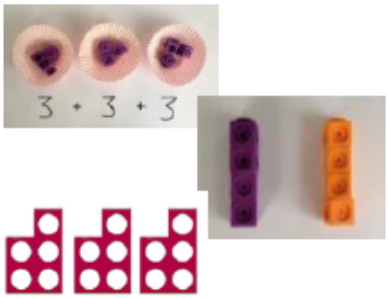
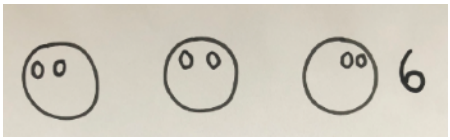
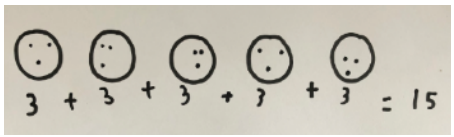
Concrete	Pictorial	Abstract
Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling.  	Draw pictures to show how to double numbers. 	*Extension for those developmentally ready:* Partition a number and then double each part before recombining it back together.

Counting in multiples

Concrete	Pictorial	Abstract

Count the groups as children are skip counting. Children may use their fingers as they are skip counting.	Children make representations to show counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 

Repeated Addition.

Concrete	Pictorial	Abstract
Use different objects to add equal groups. 	Use pictorial representations, including number lines, to solve problems. *e.g. There are 2 sweets in each bag. How many sweets are in 3 bags?* 	Write addition sentences to describe objects and pictures. *Use lanagugae of equal throughout process*  *When developmental ready: Link to 3 x 5 =*

Calculation strategies for multiplication and division

Multiplication

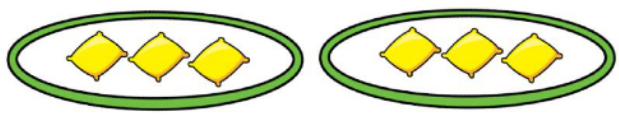
Progression in multiplication stay in 2s 5s 10s

- Number lines to show repeated groups. Cuisenaire rods can be used too.
- Represent this pictorially alongside a number line e.g.:

Division

Sharing using a range of objects.

6 ÷ 2



Children will record calculations horizontally. They make informal jottings for calculations. They will use a range of concrete objects to support their understanding of calculation methods before moving on to a pictorial approach. They may make use of a numbered, progressing to a blank number line to support their mental calculations.

Year 2

Addition and Subtraction Vocabulary	Multiplication and Division Vocabulary

+, add, addition, more, plus	Multiples
Make, sum, total	Grouping
Altogether	Sharing
Score	Double, doubling
Double, near double	Halve/halving
One more, two more…ten more	Arrays
How many more to make…?	Number patterns
How many more is… than…?	Lots of, groups of
-, subtract, subtraction, take (away), minus, difference	X, times, multiply, multiplied by, multiplication
	Multiple of, multiplication tables
Leave, how many are left/left over?	Once, twice, three times…twelve times
One less, two less…ten less	Times as (big, long, wide… and so one)
How many fewer is… than…?	Repeated addition
How much less is…?	Array
Difference, difference between, distance between	Row, column
Half, halve	Times tables
=, equals, is the same as	Double, halve
number bonds	Share, share equally
Subtraction facts	One each, two each, three each…
Value	Group in pairs, threes…
Size	Equal groups of
More than, less than	÷, divide, divided by, divided into, division
Tens boundary	Inverse
Commutative	Odd, even
Mental method	commutative
Written method	

Do
Ensure children are confident with mental methods
Insist on aligning digits in the correct columnar value
Have each digit in its own square
Write the operation symbol at the left-hand side of the calculation.
Remind children to strike out digits that have been exchanged once they've been added.
Not extend the content beyond your year group.
Encourage children to use their number sense to estimate answers prior to calculations.
Consider the most efficient method of calculating.
Present calculations in different formats – horizontally, vertically, answer before question
Use a range of vocabulary to familiarise the children with the different words for the operators.
Refer to times table expectation document (see appendix) to ensure all multiplication and division calculations posed meet the expectations for the year group.
Provide children with multiplication girds when teaching written methods to ensure all children can access the method even if they are unfamiliar with multiplication and division facts.

Children will begin by ensuring they are proficient in mental addition and subtraction, consolidating the use of a number line as taught in Year 1. They will be introduced to recording calculations vertically. By the end of Year 2, children should be equally competent in recording calculations vertically and horizontally. They make informal jottings for calculations. They may make use of a numbered progressing to a blank number line to support their mental calculation, however this should be discouraged towards the end of Year 2 as their mental calculation skills improve. By the end of year 2, most children will be competent using standard written methods for addition (with one exchange) and subtracting (without exchange) having used base ten to support their understanding.

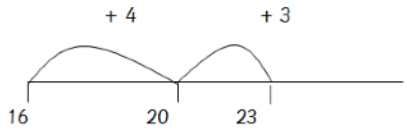
Calculations should be presented to children in different ways. For example:

- 19 + 7 = ◊, ◊ = 16 + 58, 94 = ◊ + 79, 68 = 34 + ◊, 82 = 54 ◊ 28, 65 ◊ 19 = 84
- 19 – 3 = ◊, ◊ = 23 - 5, 91 = ◊ - 4, 8 = 15 - ◊, 72 = 95 ◊ 23, 89 ◊ 9 = 80
- 9 x 5 = ◊, ◊ = 6 x 2, 45 = ◊ x 5, 40 = 5 x ◊, 40 = 10 ◊ 4, 6 ◊ 10 = 60
- 10 ÷ 2 = ◊, ◊ = 60 ÷ 10, 11 = ◊ ÷ 5, 8 = 80 ÷ ◊, 12 = 24 ◊ 2, 60 ◊ 5 = 12

Addition

Addition should be taught in the following order of progression:

- Focus on mental methods, including bridging through ten and fact families. (eg. I know 7 + 6 = 13, so 17 + 6 = 23, 27 + 6 = 33 ..etc)
- Autumn and Spring 1, focus should be on the use of blank number lines.
  Use of a number line to support mental jottings.



- In Spring 2, begin by modelling the addition of two 2-digit numbers that will not involve exchanging using base ten (e.g. 23+41)
- Move to adding two 2-digit numbers that involve exchange of ones for tens (e.g. 35+58)

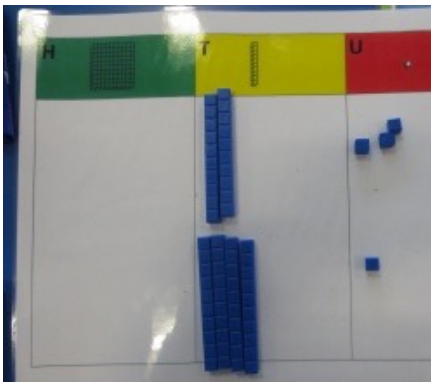
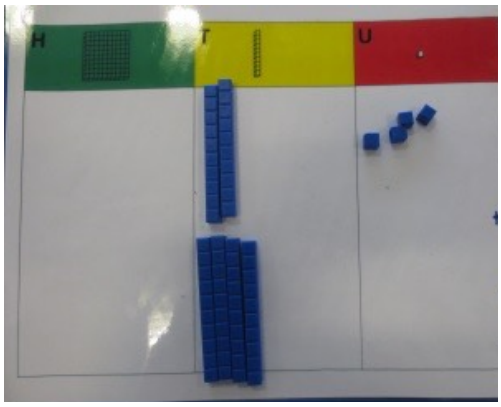
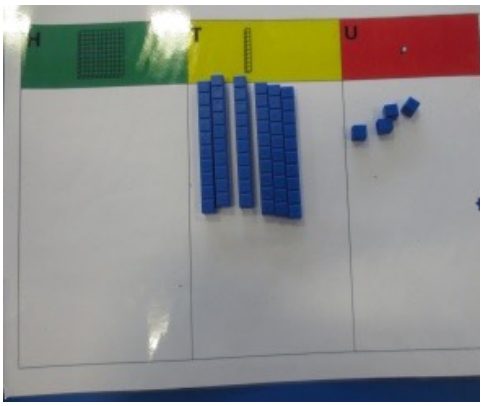
The National Curriculum states *Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers*

There is **NOT** an expectation that children in KS1 will complete formal written methods for addition. However, place value columns can be used alongside pictorial representations to demonstrate place value.

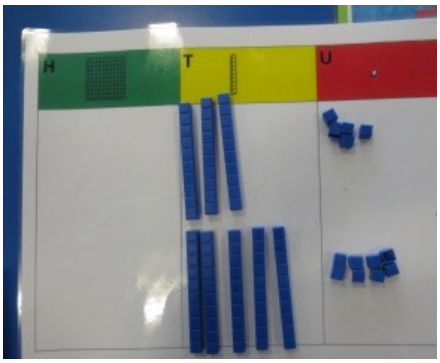
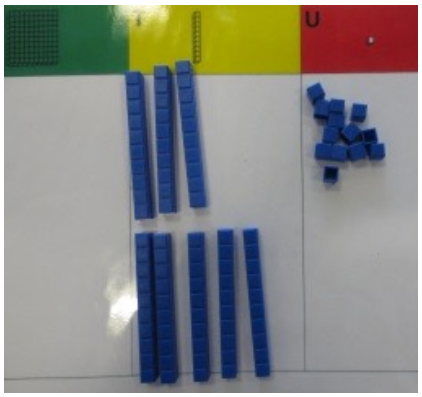
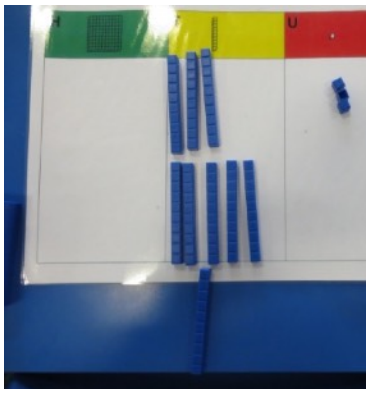
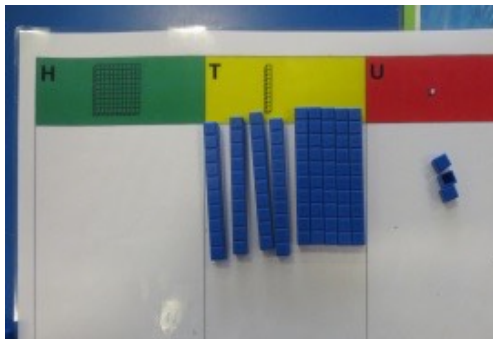
Although the National Curriculum states there is NOT an expectation of a written method in Summer but when children are developmentally ready, we will introduce them to this once they have a solid understanding of mental methods

Some children will then be able to complete the calculations abstractly, whilst others will continue to need the support of base ten.

Adding two 2-digit numbers without exchange

Addition should be taught in the following order of progression: 	Set out **BOTH** numbers (e.g. 23, 41) that are to be added together using base ten materials in columns (as written method).
	**Start at the ones** and add them together. Say how many ones there are.
	Now add the tens. Say how many tens there are. (use the **correct denomination vocabulary**, e.g. “6 tens” not just “6”)
	Now say how many altogether the blocks total. (e.g. “sixty four”)

Adding two 2-digit numbers involving exchange.

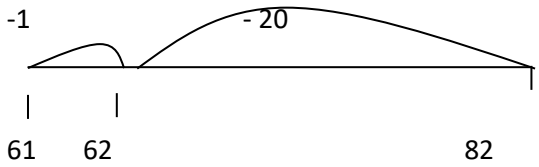
	Set out **BOTH** numbers (e.g. 35, 58) that are to be added together using base ten materials in columns (as written method).
	**Start at the ones** and add them together. Say how many ones there are.
	As the ones total is more than 10, exchange ten ones for one ten. Place the tens rod at the bottom of the tens column.
	Now add all the tens together (remembering the ten from the exchange).
	Now say how many altogether the blocks total. (e.g. “ninety three”)

Subtraction

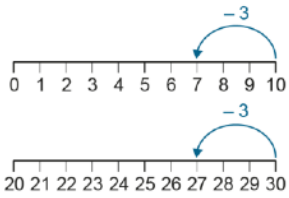
Subtraction should be taught in the following order of progression:

- Focus on mental methods, including bridging through ten and fact families. (eg. I know 12 – 4 = 8 so 22 – 4 = 18, 32 – 4 = 28 …etc)
- Autumn and Spring 1, focus should be on the use of blank number lines. First without bridging ten, then with.

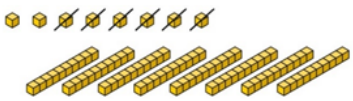
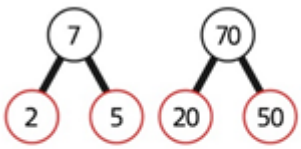
  Use of a number line to support mental jottings with a vertical calculation.



- Apply known facts

Concrete	Pictorial	Abstract
Tens frames to make connections	Use of number lines to represent known facts 	10 – 3 = 7 30 – 3 = 27

- Subtracting multiples of 10
- Use known number bonds and unitising to subtract multiples of 10

Concrete	Pictorial	Abstract
Move objects away from the group  *8 subtract 6 is 2.* *So, 8 tens subtract 6 tens is 2 tens.*	 *7 tens subtract 5 tens is 2 tens.* *70 – 50 = 20*	80 – 20 = 60

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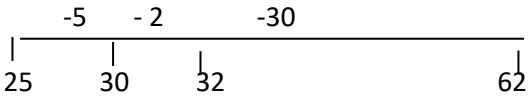
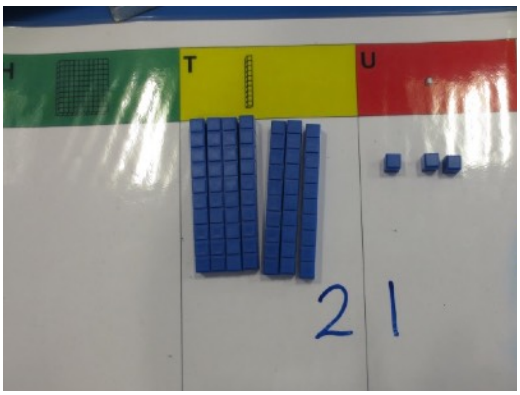
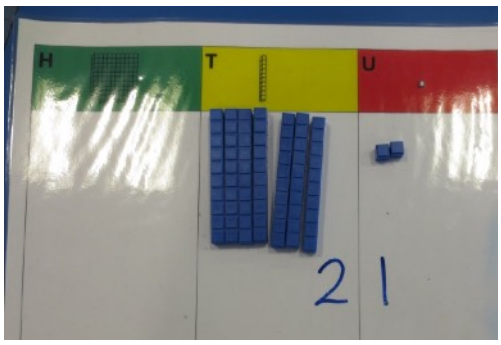
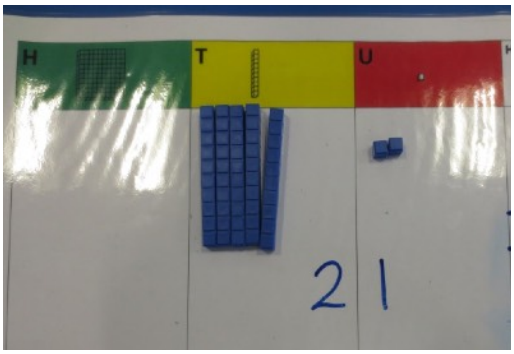


- In Spring 2, begin by modelling the subtracting of two 2-digit numbers that will not involve exchanging using base ten (e.g. 48 - 24)

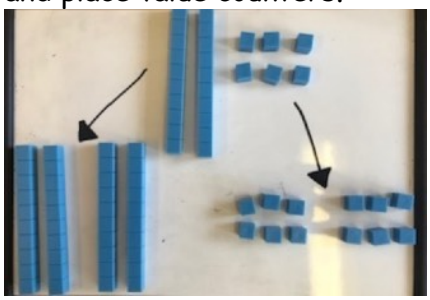
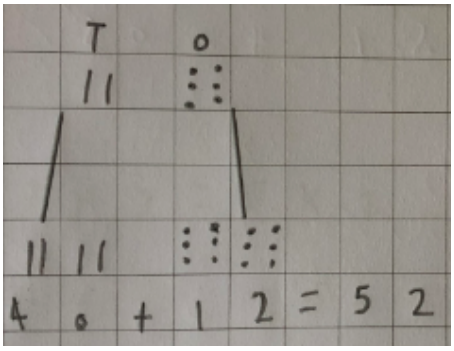
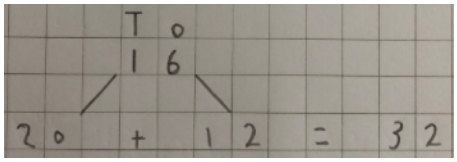
Subtracting without exchange

	Set out the FIRST NUMBER ONLY (e.g. 73) using base ten materials in columns (as written method).
	Start at the ones and subtract the amount necessary (e.g. 1). Physically remove the base ten materials from the board.
	Now move to the tens and subtract the amount necessary (e.g. 2 tens). Remember to use the correct denomination vocabulary, e.g. “2 tens” not just “2”. Again, physically remove the base ten materials from the board.
	Now say how many blocks you are left with. (e.g. “fifty-two”)

Multiplication and Division

Multiplication and division continue to be taught using a concrete (Cuisenaire rods and number tracks, Numicon or counting objects) and pictorial (arrays and bar model) approach. Fact families should be taught together in order to promote children's ability to recall known facts and make links between corresponding calculations. Once ready to progress from representations, children will record answers to calculations using known facts.

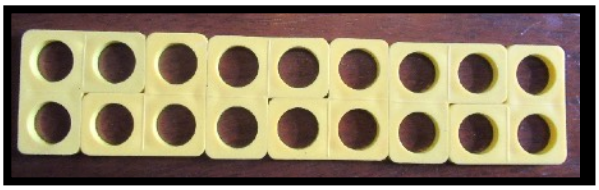
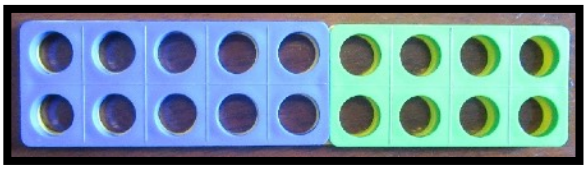
Doubling

Concrete	Pictorial	Abstract
Model doubling using dienes and place value counters.  Double 26 = 40 + 12 = 52	Draw pictures to represent how to double numbers. 	Partition a number then double each part before recombining it. 

Repeated addition

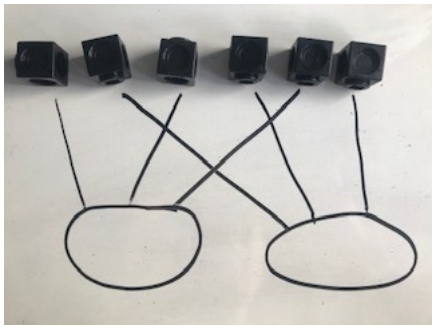
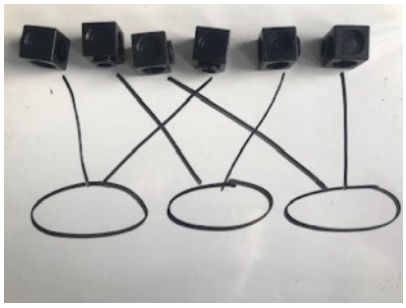
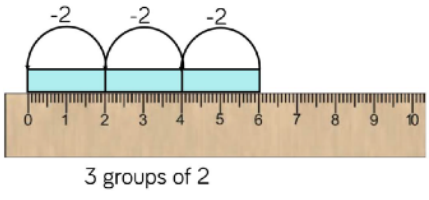
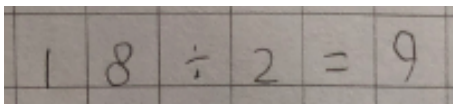
Use Numicon to demonstrate repeated addition.

Concrete	Pictorial	Abstract

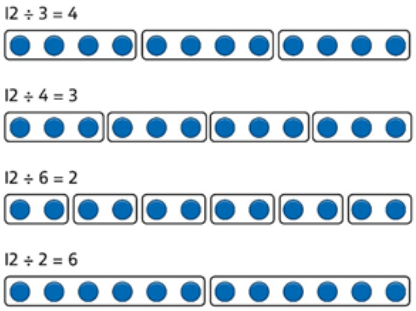
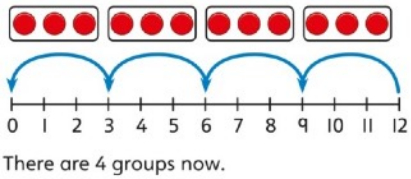
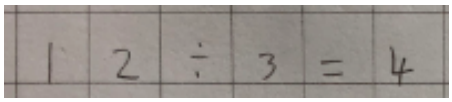
  	• •	3 x 6 = 18 6 x 3 = 18

Sharing

Concrete	Pictorial	Abstract

Start with a whole and share into equal parts, one at a time.  *12 shared equally between 2.* *They get 6 each.* Start to understand how this also relates to grouping. To share equally between 3 people, take a group of 3 and give 1 to each person. Keep going until all the objects have been shared  *6 shared equally between 3.* *They get 2 each.* • Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Represent the objects shared into equal parts using a partitioning diagram *12 shared into 3 equal parts.* *There are 4 in each part.*	Children will need to be introduced to the symbol for division  Children should be able to verbalise this as 18 divided into 2 groups means there are 9 in each group.

Grouping

Concrete	Pictorial	Abstract
Children understand how to make equal groups from a whole.   *8 divided into 4 equal groups.* *There are 2 in each group.*	Children understand the relationship between grouping and the division statements.  Children understand how to relate division by grouping to repeated subtraction.  There are 4 groups now. *12 divided into groups of 3.* *12 ÷ 3 = 4* *There are 4 groups.* If I share 12 sweets between 4 children, how many will they have each? 12 ÷ 4 = 3 	 Children should be able to verbalise this as 12 grouped into 3s = 4 groups

Addition and Subtraction Vocabulary	Multiplication and Division Vocabulary
+, add, addition, more, plus Make, sum, total Altogether Score Double, near double One more, two more…ten more…one hundred more How many more to make…? How many more is… than…? -, subtract, subtraction, take (away), minus Leave, how many are left/left over? One less, two less…ten less How many fewer is… than…? How much less is…? Difference between Half, halve =, equals, is the same as Tens boundary, hundreds boundary Mentally, written method Column addition	Lots of, groups of X, times, multiply, multiplied by, multiplication Multiple of, product Multiplication tables Once, twice, three times…twelve times Times as (big, long, wide… and so one) Repeated addition Array Row, column Times tables Double, halve Share, share equally One each, two each, three each… Group in pairs, threes… Equal groups of ÷, divide, divided by, divided into, division Left, left over, division Inverse Commutative, commutativity Associative, associativity Four times as high, eight times as high etc

Do
Insist on aligning digits in the correct columnar value.
Have each digit in its own square
Write the operation symbol at the left-hand side of the calculation.
Remind children to strike out digits that have been exchanged once they've been added.
Not extend the content beyond your year group.
Encourage children to use their number sense to estimate answers prior to calculations.
Consider the most efficient method of calculating.
Present calculations in different formats – horizontally, vertically, answer before question
Use a range of vocabulary to familiarise the children with the different words for the operators.
Refer to times table expectation document (see appendix) to ensure all multiplication and division calculations posed meet the expectations for the year group.
Provide children with multiplication girds when teaching written methods to ensure all children can access the method even if they are unfamiliar with multiplication and division facts.

Addition

Children will continue to be taught to use standard column addition using Base 10 until children are competent to move to an abstract approach. It is imperative to teach these methods using the correct format and vocabulary and talking through each step. (See Year 2 for examples). Encourage the children to talk through each step of the calculation to ensure they have a clear understanding of the method and are confident using the vocabulary.

Addition should be taught in the following order of progression:

- Use of base ten to consolidate addition of two 2-digit numbers that involve exchange from the ones to the tens column
- Addition of two 3-dgit numbers that involves different exchanges (e.g. exchange 10 ones for 1 ten, then 10 tens for 1 hundred)
- Move to calculations involving more than one exchange (e.g. ones exchanged for ten, tens exchanged for hundred etc)
- Finally, move on to adding a 3-digit and 2-digit numbers.
- Addition can be further developed by giving children calculations with missing digits and numbers where they must apply their reasoning skills or knowledge of inverse operations. (eg. 2_7 + 13_ = 459 or 587 + ___ = 846)

By the end of Year 3, children should be able to carry out standard column addition involving exchange. Most children will have progressed to column addition without the support of base ten.

Subtraction

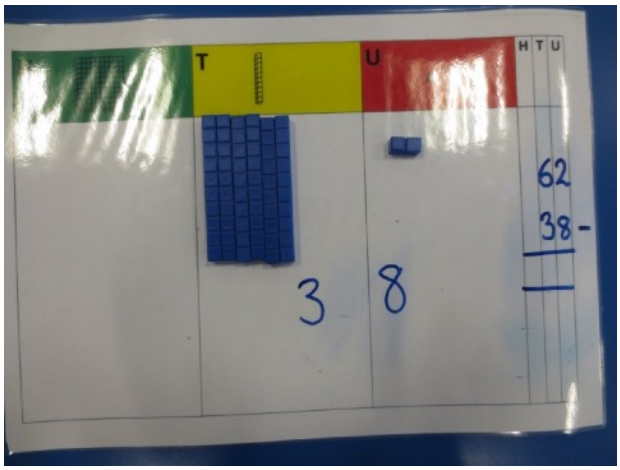
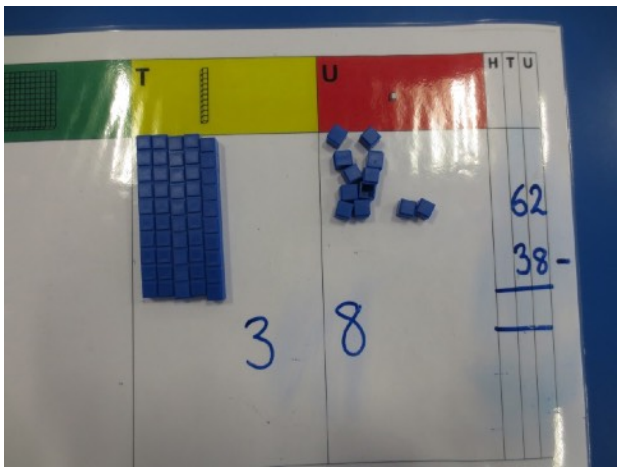
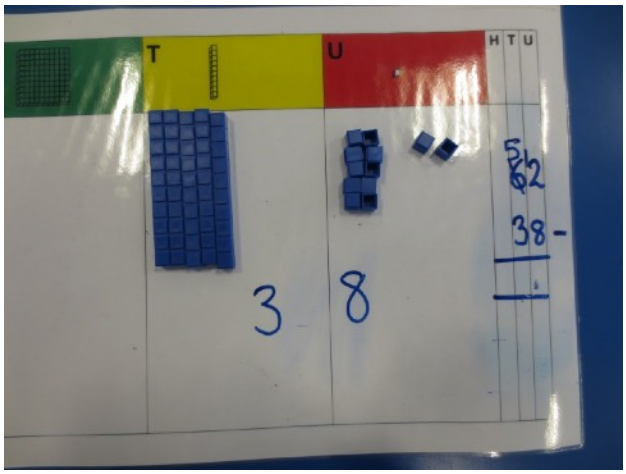
Children will be taught decomposition using base ten. It is imperative to teach this method using the correct resources, format, vocabulary and talking through each step. (See following examples for details). Encourage the children to talk through each step of the calculation to ensure they have a clear understanding of the method.

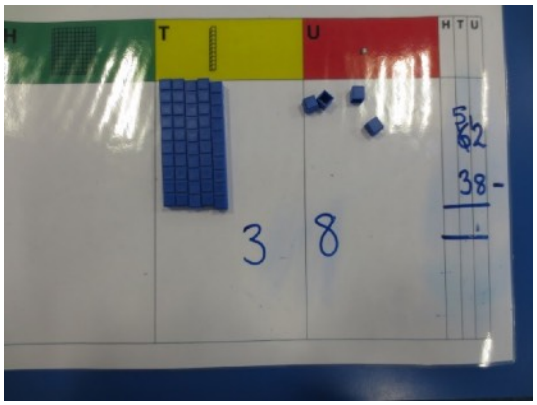
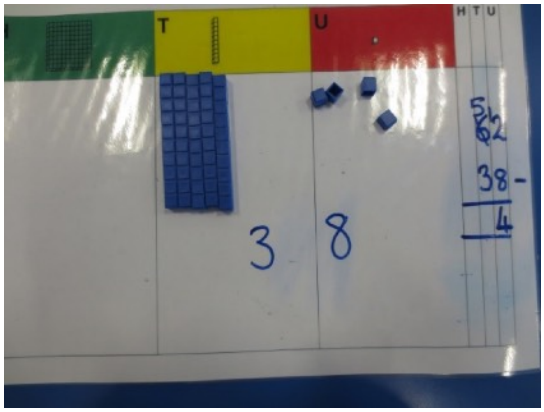
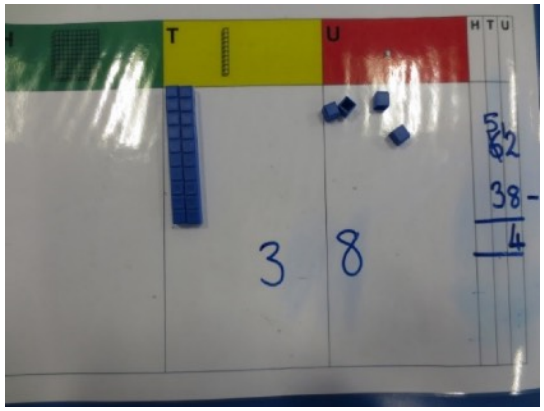
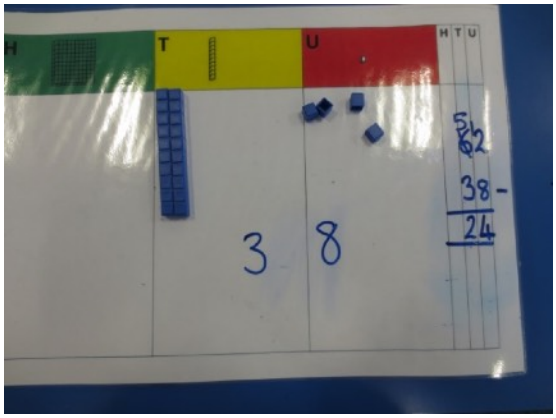
Subtraction should be taught in the following order of progression:

- The subtraction of two 2-digit numbers that will not involve exchanging
- Move to subtracting two 2-digit numbers that involve exchange of tens for ones (e.g. 85 -58)
- Once confident, move to subtraction of two 3-digit numbers that involve different exchanges (e.g. exchange 10 ones for 1 ten, 1 hundred for 10 tens)
- Move to calculations involving more than one exchange (e.g. ten exchanged for ones, hundred exchanged for tens etc)
- Finally, move on to subtracting a 3-digit and 2-digit number.

By the end of Year 3, children should be able to carry out decomposition, involving exchange. Most children will be able to complete these calculations without the support of base ten.

Subtracting with exchange

	Set out the FIRST NUMBER ONLY (e.g. 62) using base ten materials in columns (as written method). It is helpful to use a baseboard labelled as TO or HTO) to support correct layout.
	Start at the ones and try to subtract the amount necessary (e.g. 8 ones).
	As it is impossible to subtract (2-8), make an exchange. (e.g. exchange a ten for ten ones)
	The base ten will now show 50+12. Remind children at this stage (before they subtract anything) that they still have 62, however it looks like 50 + 12. It's an example of "same value, different appearance".

	Subtract the necessary ones. Remember to use the correct denomination vocabulary, e.g. “12 ones take away/subtract 8 ones”. Physically remove the base ten from the board.
	Record the remaining ones answer in its correct column on the calculation.
	Now move to the tens and subtract the amount necessary. Remember to use the correct denomination vocabulary, e.g. “5 tens take away/subtract 3 tens”.
	Record the remaining tens answer in its correct column.
	• Now say how many blocks you are left with. (e.g. “twenty four”)

Multiplication

Children will be taught to multiply TU x U progressing to HTU x U using the grid method.

Eg.

24 x 8 =

x	8
4	32
20	160
+	192

235 x 3 =

x	3
5	15
30	90
200	600
+	705
	1

Division

Short division will be taught supported by place value counters. It is imperative to teach this method using the correct format, correct vocabulary and talking through each step. (See following examples for details). Encourage the children to talk though each step of the calculation to ensure they have a clear understanding of the method.

Division should be taught in the following order of progression:

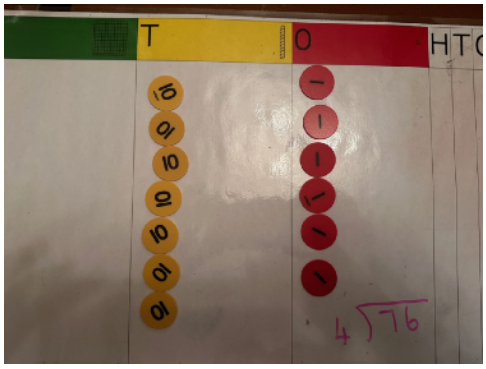
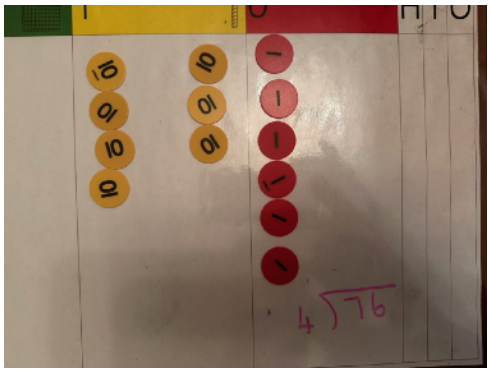
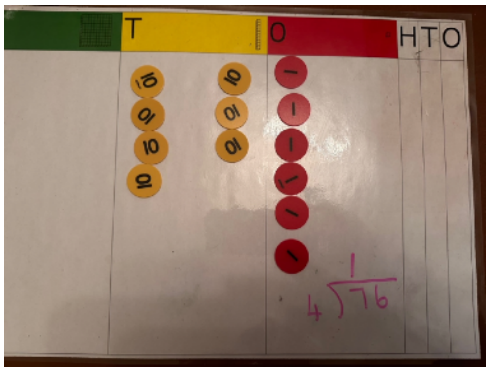
- TU ÷ U (no remainder)

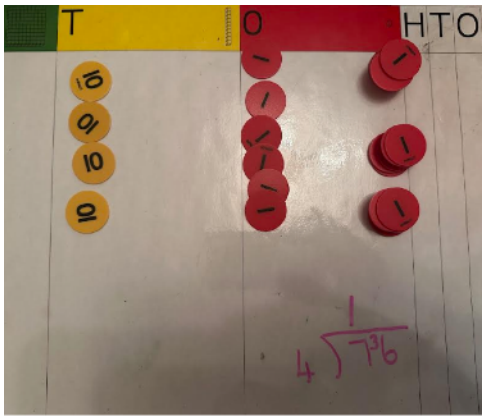
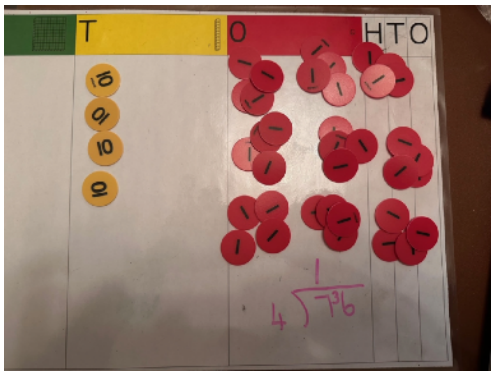
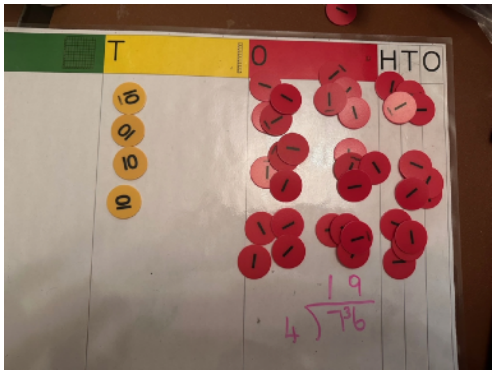
Eg.

$$\begin{array}{r|lll} & 2 & 1 & 9 \\ \hline 4 & 8 & 7 & {}^{3}6 \end{array}$$

By the end of Year 3, most children should be able to use short division to divide 2-digit numbers without remainders with the support of place value counters.

TU ÷ U (no remainder)

6	Set out the calculation like this.
	Get out 76 using place value counters (i.e. 7 ten counters and 6 ones counters).
	Put the tens counters into groups of 4. How many groups of 4 can you make?
	You can make one group of four tens. Record this above the 7.

	Now exchange the 3 ten counters you have left into ones counters. This gives you 36 ones counters. Record it like this.
	Put the ones counters into groups of 4. How many groups of 4 can you make?
	You can make nine groups. Record this above the 6.

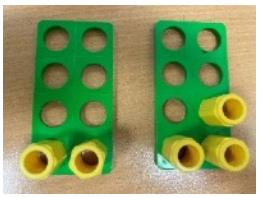
Adding fractions

Children will add fractions with the same denominator. The answer will remain withing 1. Follow the CPA approach.

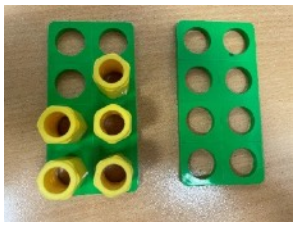
$$\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$

Concrete

Set out the Numicon with the denominator as the Numicon piece and the pegs as the numerator.



Move the pegs to fill the pieces.



Pictorial

Draw bar models to represent the fractions.

Cross out the boxes on the fractions and use these to complete the incomplete boxes.

Abstract

Add the numerators together.

Remember the denominators do not get added.

$$\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$

Subtracting fractions

Children will subtract fractions with the same denominator.

Follow the CPA approach.

$$\frac{6}{7} - \frac{1}{7} = \frac{5}{7}$$

Concrete

Set out the Numicon with the denominator as the Numicon piece and the pegs as the numerator.

Remove the pegs of the subtrahend.

Record what you have left as your answer with simplified fraction if possible.

Pictorial

Draw bar models to represent the minuend.

Cross out the number of boxes of the subtrahend on the fraction.

Record your answer.

Year 4

Addition and Subtraction Vocabulary	Multiplication and Division Vocabulary
Add, addition, more, plus, increase Sum, total, altogether Score Double, near double How many more to make…? Subtract, subtraction, take (away), minus, decrease Leave, how many are left/left over? Difference between Half, halve How many more/fewer is…than…? How much more/less is…? Equals, sign, is the same as Tens boundary, hundreds boundary inverse Column addition, column subtraction Estimate Mental methods. Mentally Columnar addition, column addition Columnar subtraction, column subtraction	Lots of, groups of Times, multiply, multiplication, multiplied by Multiple of, product Once, twice, three times…twelve times Times as (big, long, wide…and so on) Repeated addition Array Row, column Double, halve Share, share equally One each, two each, three each Group in pairs, threes… twelves Equal groups of Divide, division, divided by, divided into Remainder, left over Factor, quotient, divisible by Inverse Factor, factor pairs Distributive, distributive law Integer scaling Associative, commutativity Short multiplication Four times as high… Distributive Derive

Do
Insist on aligning digits in the correct columnar value.
Use decimal points to help align the digits when using numbers with differing columnar values.
Have each digit in its own square
Have the decimal point in its own square
Write the operation symbol at the left-hand side of the calculation.
Encourage the use of commas between millions and thousands and thousands and hundreds to help when reading the number.
Remind children to strike out digits that have been exchanged once they've been added.
Not extend the content beyond your year group.
Encourage children to use their number sense to estimate answers prior to calculations.
Consider the most efficient method of calculating.

Addition

Children will continue to consolidate their use of standard column addition. They will progress to adding numbers with 2 decimal places in the context of money. Integers may have up to 4 digits.

	£	5	.	4	3		£	6	.	8	8		£	1	9	.	7	5
+	£	2	.	3	7	+	£	2	.	3	1	+	£	1	8	.	8	7
	£	8	.	8	0		£	9	.	1	9		£	3	8	.	6	2
		1		1				1						1	1		1	

Subtraction

Children will continue to consolidate their use of decomposition for subtraction. They are to be introduced to calculations where they must complete two exchanges as the next column has 0. Integers may have up to 4 digits.

	8	91	1
	9	0	1
-	6	8	3
	2	1	8

They will progress to subtracting numbers with 2 decimal places in the context of money.

		6		14	1
	£	7	.	5	3
-	£	3	.	7	6

£	2	.	7	7

Multiplication

Children will multiply 2-digit numbers by 1-digit numbers.

$$\begin{array}{rr} & 2\ 6 \\ \times & \quad 7 \\ \hline 1 & 8\ 2 \\ \hline & {\scriptstyle 4} \end{array}$$

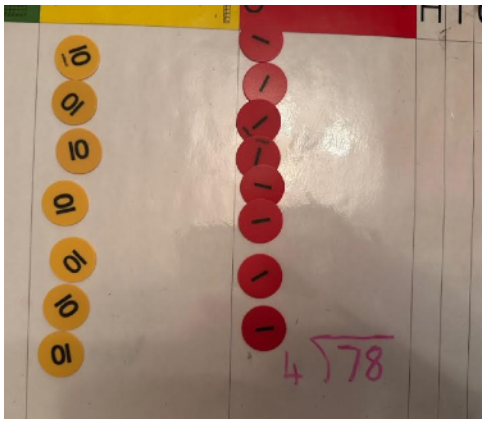
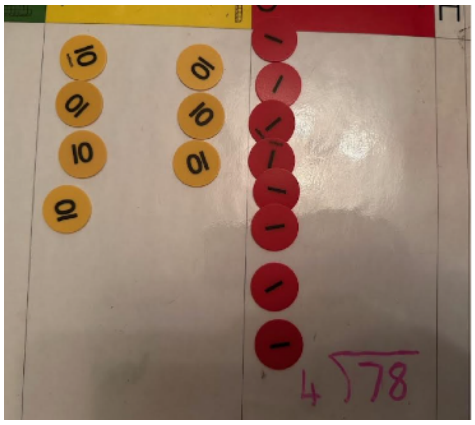
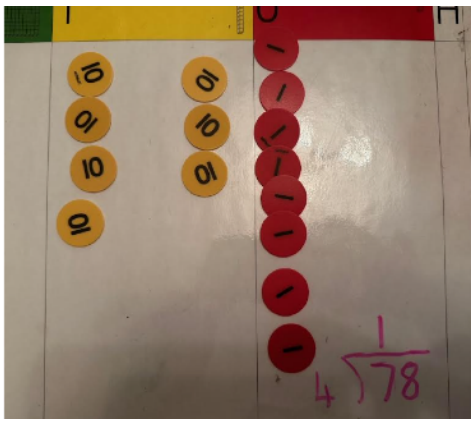
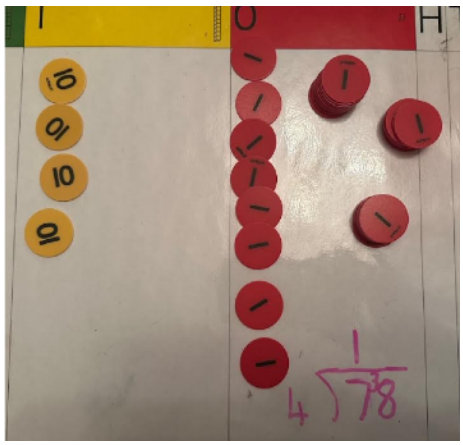
Division

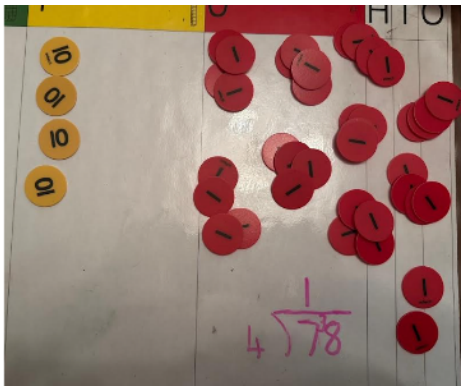
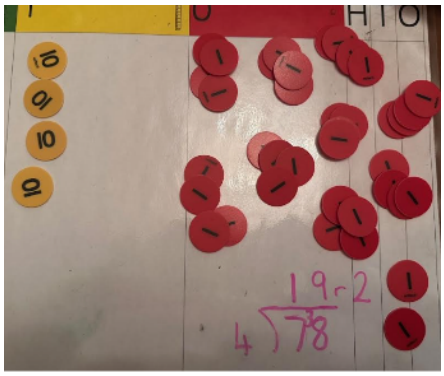
Children consolidate their application of short division, dividing 3-digit numbers by 1-digit numbers, including remainders.

$$\begin{array}{r|l} & 1\ 9\ 2\ r\ 1 \\ \hline 4 & 7\ {}^{3}6\ 9 \end{array}$$

TU ÷ U (with remainder)

8	Set out the calculation like this

	Get out 78 using place value counters (i.e. 7 ten counters and 8 ones counters)
	Put the ten counters into groups of 4. How many groups of 4 ten counters can you make?
	You can make one group. Record this above the 7.
	Now exchange the 3 ten counters you have left into ones counters. This gives you 38 ones counters. Record it like this.

	Put the ones counters into groups of 4. How many groups of 4 ones counters can you make?
9 8	You can make nine groups. Record this above the 6.
	How many ones counters are left over? Record this as your remainder.

<u>Adding fractions</u>

Children will add fractions with the same denominator. The answer may go into a mixed number. Follow the CPA approach.

$$\frac{7}{8} + \frac{2}{8} = \frac{9}{8} = 1\frac{1}{8}$$

Concrete

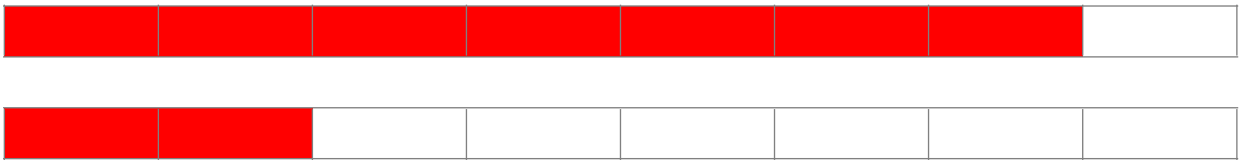
Set out the Numicon with the denominator as the Numicon piece and the pegs as the numerator.

Move the pegs to fill the pieces.

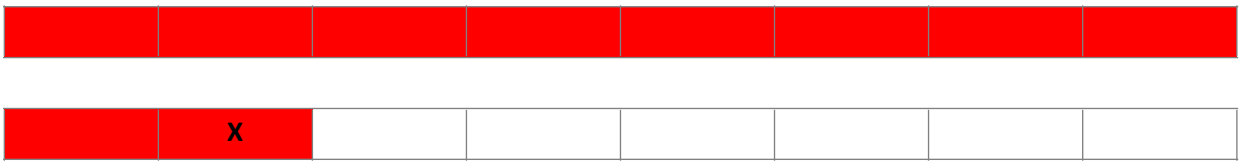
Record what you have as a mixed number with simplified fraction if possible.

Pictorial

Draw bar models to represent the fractions.



Cross out the boxes on the fractions and use these to complete the incomplete boxes.



Record what you have as a mixed number with simplified fraction if possible.

Abstract

Add the numerators together.

Remember the denominators do not get added.

Convert the improper fraction to a mixed number if possible.

Simplify your proper fractions where possible.

$$\frac{7}{8} + \frac{3}{8} = \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4}$$

Subtracting fractions

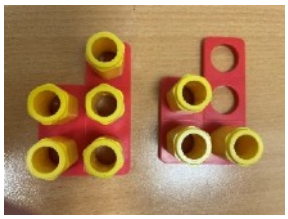
Children will subtract fractions with the same denominator.

Follow the CPA approach.

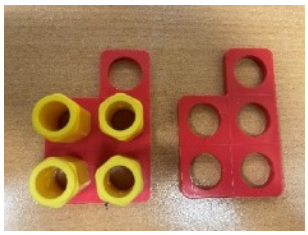
$$1\frac{3}{5} - \frac{4}{5} = \frac{4}{5}$$

Concrete

Set out the Numicon with the denominator as the Numicon piece and the pegs as the numerator.



Remove the pegs of the subtrahend.



Record what you have left as your answer with simplified fraction if possible.

Pictorial

Draw bar models to represent the minuend.

Cross out the number of boxes of the subtrahend on the fraction.

X	X	X		

Record your answer.

Abstract

Add the numerators together.

Remember the denominators do not get added.

Convert the improper fraction to a mixed number if possible.

Simplify your proper fractions where possible.

$$\frac{7}{8} + \frac{3}{8} = \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4}$$

Year 5

Addition and Subtraction Vocabulary	Multiplication and Division Vocabulary

Add, addition, more, plus, increase Sum, total, altogether Score Double, near double How many more to make…? Subtract, subtraction, take (away), minus, decrease Leave, how many are left/left over? Difference between Half, halve How many more/fewer is…than…? How much more/less is…? Equals, sign, is the same as Tens boundary, hundreds boundary Ones boundary, tenths boundary Inverse Mental methods, written methods	Lots of, groups of Times, multiply, multiplication, multiplied y Multiple of, product Once, twice, three times…twelve times Times as (big, long, wide…and so on) Repeated addition Array Row, column Double, halve Share, share equally One each, two each, three each Group in pairs, threes… twelves Equal groups of Divide, division, divided by, divided into Remainder Factor, quotient, divisible by Inverse, inverses Factor, factor pairs Distributive, commutative Associative Derive Express, expressing Scale, scaling, integer scaling Prime, prime numbers, prime factor Composite Equivalence Mental methods, written methods

Do
Insist on aligning digits in the correct columnar value.
Use decimal points to help align the digits when using numbers with differing columnar values.
Have each digit in its own square
Have the decimal point in its own square
Write the operation symbol at the left-hand side of the calculation.
Encourage the use of commas between millions and thousands and thousands and hundreds to help when reading the number.
Remind children to strike out digits that have been carried over once they've been added.
Only teach the content for your year group.
Encourage children to use their number sense to estimate answers prior to calculations.
Not extend past your year group.
Consider the most efficient method of calculating

Addition

Children will continue to consolidate their use of standard column addition. They will progress to adding numbers with mixed decimal places. They will use zeroes as place holders to ensure digits are aligned correctly. Integers may have more than 4 digits.

1,256.4 + 246.58 = 1,502.98

	1,	2	5	6	.	4	0
+		2	4	6	.	5	8
	1,	5	0	2	.	9	8
		1	1				

Subtraction

Children will progress to using decomposition to subtract numbers of mixed decimal places, with 4 or more digits. They will use zeroes as place holders to ensure digits are aligned correctly.

2,598.3 – 1,287.36 =

				7		12	1	
	2,	5	9	8	.	3	0	
-	1,	2	8	7	.	3	6	
	1,	3	1	0	.	9	4	

This will progress to exchanging over two columns.

2,404.23 – 1,789.6 = 614.63

	1	13	19	13		1		
	2,	4	0	4	.	2	3	
-	1,	7	8	9	.	6	0	
	0	6	1	4	.	6	3	

Multiplication

Short multiplication will be used to multiply up to 4 digits by 1 digit.

	2,	3	6	3	
x				6	
1	4	1	7	8	
	2	3	1		

Long multiplication will be used to multiply by 2-digit numbers. When multiplying by the tens digit, a zero will be used as a place holder. We can call this a 'magic zero' to help the children remember to use it. Initially, use a coloured pencil for the 'magic zero'. We will then multiply by 4 tens.

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

Division

Children consolidate their application of short division, dividing 4-digit numbers by 1-digit numbers, including remainders.

	1,	9	4	2	r1
4	7,	$^{3}7$	$^{1}6$	9	

Following this, they will move on to giving answers with proper fractions.

	1,	9	4	2	$\frac{1}{4}$
4	7,	$^{3}7$	$^{1}6$	9	

This will be developed further by giving answers with up to 3 decimal places when adding zeroes as place holders.

	1,	9	4	2	.	2	5
4	7,	$^{3}7$	$^{1}6$	9	.	$^{1}0$	$^{2}0$

Adding fractions with different denominators

One denominator will be a multiple of the other. Convert the fractions into equivalences so the denominator is the same. Simply the answer if possible.

$$\frac{3}{5} + \frac{1}{15} = \frac{2}{3}$$

$$\frac{9}{15} + \frac{1}{15} = \frac{10}{15} = \frac{2}{3}$$

Subtracting fractions with different denominators

One denominator will be a multiple of the other. Convert the fractions into equivalences so the denominator is the same. Simply the answer if possible.

$$\frac{2}{3} - \frac{1}{9} = \frac{5}{9}$$

$$\frac{6}{9} - \frac{1}{9} = \frac{5}{9}$$

Multiplying proper fractions by integers

Follow the CPA approach.

$$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$$

Concrete

Set out the Numicon with the denominator as the Numicon piece and the pegs as the numerator.

Move the pegs to fill the pieces.

Record what you have as a mixed number with simplified fraction if possible.

Pictorial representation

$$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$$

Draw bar models to represent the fractions.

Cross out the boxes on the fractions and use these to complete the incomplete boxes.

Record what you have as a mixed number with simplified fraction if possible.

This will then progress to abstract calculations.

Multiplying mixed numbers by integers

Follow the CPA approach.

$$1\frac{1}{2} \times 3 = 4\frac{1}{2}$$

Concrete

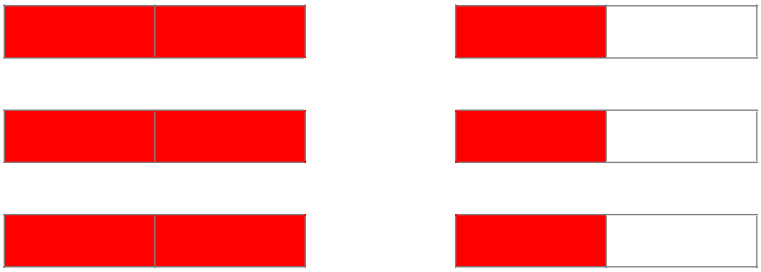
Set out the Numicon with the denominator as the Numicon piece and the pegs as the numerator.

Move the pegs to fill the pieces.

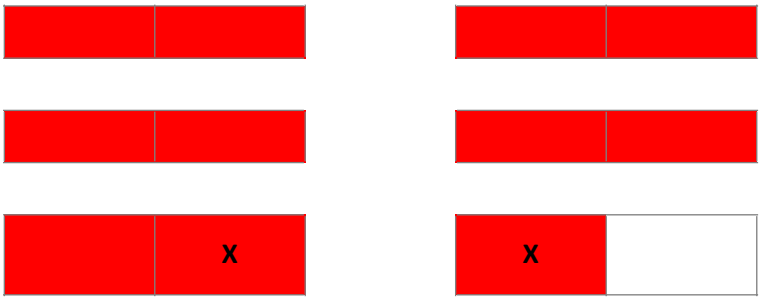
Record what you have as a mixed number with simplified fraction if possible.

Pictorial representation

Draw models like those below or bar models to represent the fractions.



Cross out the boxes on the fractions and use these to complete the incomplete boxes.



Record what you have as a mixed number with simplified fraction if possible.

Abstract

Multiply the integer by the whole number of the fraction.

Multiply the fraction by the integer.

Add the two numbers together.

$$1\frac{1}{2} \times 3 = 4\frac{1}{2}$$

$$1 \times 3 = 3$$

$$\frac{1}{2} \times 3 = \frac{3}{2} = 1\frac{1}{2}$$

$$3 + 1\frac{1}{2} = 4\frac{1}{2}$$

Year 6

Addition and Subtraction Vocabulary	Multiplication and Division Vocabulary
Add, addition, more, plus, increase Sum, total, altogether Score Double, near double How many more to make…? Subtract, subtraction, take (away), minus, decrease Leave, how many are left/left over? Difference between Half, halve How many more/fewer is…than…? How much more/less is…? Equals, sign, is the same as Tens boundary, hundreds boundary Ones boundary, tenths boundary Inverse	Lots of, groups of Times, multiply, multiplication, multiplied by Multiple of, product Once, twice, three times…twelve times Times as (big, long, wide…and so on) Repeated addition Array Row, column Double, halve Share, share equally One each, two each, three each Group in pairs, threes… twelves Equal groups of Divide, division, divided by, divided into Remainder Factor, quotient, divisible by Inverse Factor, factor pairs Distributive Associative Derive Express, expressing Prime numbers, prime factor Composite Long division

Do
Insist on aligning digits in the correct columnar value.

Use decimal points to help align the digits when using numbers with differing columnar values.
Have each digit in its own square
Have the decimal point in its own square
Write the operation symbol at the left-hand side of the calculation.
Encourage the use of commas between millions and thousands and thousands and hundreds to help when reading the number.
Remind children to strike out digits that have been exchanged once they've been added.
Not extend the content beyond your year group.
Encourage children to use their number sense to estimate answers prior to calculations.
Consider the most efficient method of calculating.

Addition, Subtraction and Multiplication

Children consolidate their knowledge of short, efficient methods as taught in Year 5.

Multiplication

Multiplication of numbers with decimals (including money) will be taught using the following method:

Eg. £15.45 x 7 =

	£1	5	.	4	5
x		7			
£1	0	8	.	1	5
	3	3		3	

Children's attention should be drawn to the use of the zeroes as place holders in the tenths and hundredths column and apply their understanding of if they were to multiply the multiplicand by 0, the product would be 0.

Division

Long division

When dividing a 3- or 4- digit number by a 2-digit number, they will use long division as follows.

2 6 7 2 8	1 – 26 2 – 52 3 – 78 4 - 104 5 – 130 10 – 260	Record multiples of the divisor to the right of the page. Double the first multiple to find the second. Add the first and second to find the third. Double the second multiple to calculate the fourth. Record the tenth multiple. Halve the tenth multiple to calculate the fifth. If any further multiples are required throughout the calculation, they can be calculated using the already derived multiples.
0 2 6 7 2 8	1 – 26 2 – 52 3 – 78 4 - 104 5 – 130 10 – 260	“What is 7 divided by 26?” “It can’t be done so write 0 above the 7 on the answer line.”
0 2 6 7 ^{7}2 8	1 – 26 2 – 52 3 – 78 4 - 104 5 – 130 10 – 260	Carry your remainder of 7 over to the tens column.
0 2 6 7 ^{7}2 8	1 – 26 2 – 52 3 – 78 4 - 104 5 – 130 10 – 260	Now ask, “What is 72 divided by 26?”
0 2 2 6 7 ^{7}2 ^{20}8	1 – 26 2 – 52 3 – 78 4 - 104 5 – 130 10 – 260	“It is 2 so write 2 on the answer line above 72 and carry the remainder of 20 to the ones column.”

0 2 8 2 6 7 $^{7}2$ $^{20}8$	1 – 26 2 – 52 3 – 78 4 - 104 5 – 130 10 – 260 8 - 208	"What is 208 divided by 26?" "We don't have a close enough multiple. How could we use the multiples we have to get an answer of 108? Double 4 lots of 26." Now write 8 above the 208 on the answer line. There are no remainders so our calculation is complete.

Multiplying decimals

The multiplier digits should be in the correct column for their value. For example, when completing the calculation 2.65 x 8, it would be set out as follow:

	2	.	6	5
x	8			
2	1	.	2	0
	5		4	

When multiplying by number less than 1, relate to the fractional equivalent if possible. For example:

0.5 x 62 = 31

Relate 0.5 to ½ and find half of 62.

Dividing decimals

	£1	.	3	8
6	£8	.	$^{2}2$	$^{4}8$

Adding fractions with different denominators

Convert the fractions into equivalences so the denominator is common multiple. Simply the answer and convert to a mixed number if possible

$$\frac{2}{5} + \frac{3}{4} = 1\frac{3}{20}$$

$$\frac{8}{} + \frac{15}{} = \frac{23}{} = \frac{3}{}$$

$\frac{}{20}$ $\frac{}{20}$ $\frac{}{20}$ $\frac{}{20}$

Mixed Numbers

Convert the mixed numbers to improper fraction. Simply the answer and convert to a mixed number if possible

$$2\frac{3}{15} + \frac{2}{5} = 1\frac{3}{20}$$

$$\frac{33}{15} + \frac{6}{15} = \frac{39}{15} = 2\frac{9}{15} = 2\frac{3}{5}$$

Subtracting fractions with different denominators

Convert the fractions into equivalences so the denominator is a common multiple. Simply the answer and convert to a mixed number if possible

Proper fractions

$$\frac{7}{8} - \frac{1}{6} = \frac{17}{24}$$

$$\frac{21}{24} - \frac{4}{24} = \frac{17}{24}$$

Mixed Numbers

Convert the mixed numbers to improper fraction. Simply the answer and convert to a mixed number if possible

$$3\frac{3}{15} - \frac{4}{5} = 2\frac{2}{5}$$

$$\frac{48}{15} - \frac{12}{15} = \frac{36}{15} = 2\frac{6}{15} = 2\frac{2}{5}$$

Multiplying proper fractions by integers

Remind the children that the multiplication symbol means 'of' and relate to finding fractions of quantities.

$$\frac{3}{4} \times 16 = 12$$

Multiplying mixed numbers by integers

Multiply the integer by the whole number of the fraction.

Multiply the fraction by the integer.

Add the two numbers together.

$$1\frac{1}{2} \times 40 = 60$$

$$1 \times 40 = 40$$

$$\frac{1}{\quad} \times 40 = 20$$

$\frac{}{2}$ x 40 = 20

40 + 20 = 60

Multiplying a pair of proper fractions

Multiply the numerators together, multiply the denominators and simplify the answer of possible.

$$\frac{2}{5} \times \frac{3}{4} = \frac{6}{20} = \frac{3}{10}$$

Dividing proper fractions by whole numbers

Multiply the whole number and the denominator. The numerator stays the same. Simplify the answer if possible.

$$\frac{2}{7} \div 8 = \frac{2}{56} = \frac{1}{28}$$

Appendix

	Multiplication tables
Year 1	2, 5, 10
Year 2	2, 5, 10, 3, 4
Year 3	2,3, 4, 5, 6, 8, 10
Year 4	2,3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Year 5	all multiplication tables up to 12 x 12, scaling up and down, square, cube and prime numbers
Year 6	all multiplication tables up to 12 x 12, scaling up and down, square, cube and prime numbers