# CALCULATION POLICY:
# 4 OPERATIONS

Kingfisher Hall
PRIMARY ACADEMY

Version 1 – April 2021

## Maths at KHA

Our mathematics curriculum at Kingfisher Hall is designed to enable success for every child, regardless of background or ability, and to equip them with the necessary knowledge and skills required for a bright future. We ensure that as pupils move through the programmes of study, they are afforded opportunities to deepen and consolidate their understanding to embed long-term memory, as well as given frequent chances to apply their mathematical knowledge and skills in real life and cross-circular scenarios. Our curriculum driver of “A force for positive change” underpins every aspect of mathematics, and is embedded in teaching and learning and develop the child as a whole.

The Concrete-Pictorial-Abstract (CPA) approach underpins our teaching and learning to enable all children to deepen their contextual understanding of concepts, with use of careful planning and engaging learning experiences. Agile and adaptive teaching ensures all groups of children are given the opportunity to master the knowledge needed to apply fluency in the fundamentals of mathematics, reason mathematically following a line of enquiry and solve problems by applying their mathematics to routine and non-routine problems with increasing sophistication in their learning.

## Aim of This Policy

This calculation policy is designed to present the foundations of teaching and learning for the 4 operations through the CPA approach, and to ensure consistency and progression across the school. It is embedded in the National Curriculum and links closely (but not exclusively) with the White Rose Hub Scheme of Learning. It should be used a guide and reference point when planning each concept.

All Year Groups are included so that teachers can refer to children’s prior learning and the expectations for their following school year.

Hannah Brown and Peter Warwick

2021

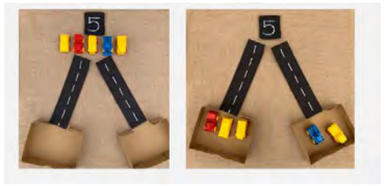
# ADDITION

**ADD PLUS + ALL TOGETHER SUM COMBINE MORE THAN INCREASED BY**

# EYFS - Addition

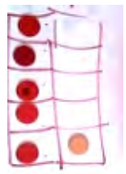
## Concrete

- Matching numbers to objects
- Matching numbers to patterns
- Counting on fingers in a consistent way
- Total numbers in two groups by counting all of them




- Use of real cubes and Numicon five-wise and pair-wise

- 5 frames: One more
- Progressing to 10 frames



(Both Five–wise and Pair-wise)

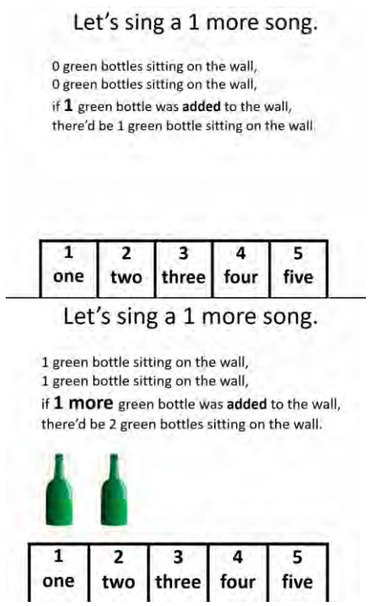
- Subitising of numbers using Numicon, dice, counters on 5 frame


- Once known doubles are established, used patterns to help add numbers eg. 4 + 4 + 1

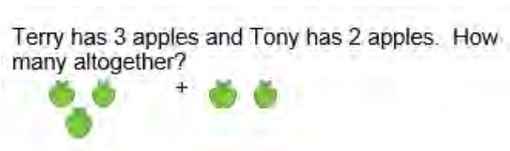
- Postbox eg. Posting a 3 Numicon and 1 more, how much do I have?

## Pictorial

- Counting forwards in 1's, 2's and 5s and 10's using stories, rhymes and songs eg. *Once a caught a fish alive, 5 little ducks, 5 green bottles*



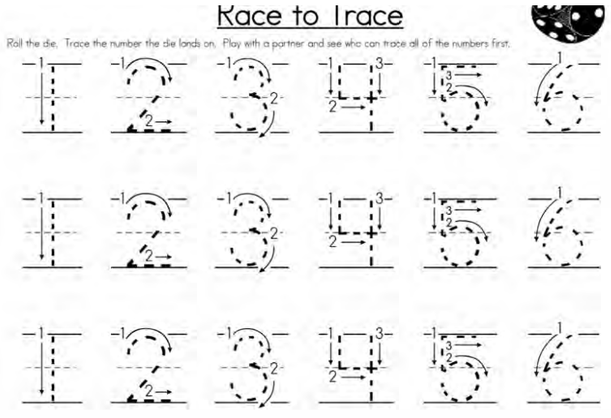

- Children's mark making
- Drawing round Numicon
- Pictorial representations of real objects for worded questions:




- Games – "One more" with die game

## Abstract

- Counting forwards in 1's, 2's and 5s and 10's using stories, rhymes and songs eg. *Once a caught a fish alive, 5 little ducks, 5 green bottles*
- Begin to recognise numerals up to 5.
- Count up to 20.
- Estimate the amount of objects and then counting the check within 20.




**Oracy Sentence Stems:**

There are more items.

____ add ____ is equal to____

## Guidance

Once children have filled the 5 frames, progress to 10 frames using double sided counters and different orientations

Subitising counters in different arrangements in the frame to show addition calculations

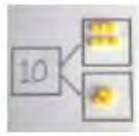
Number recognition – children should learn to instantly recognise numbers from different numbers

Digit dog challenges

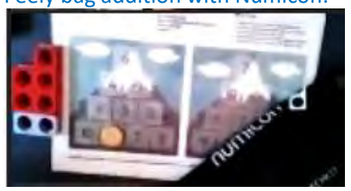
# Year 1 - Addition

## Concrete

- Use cubes (or practical equipment eg. car park example from YR)

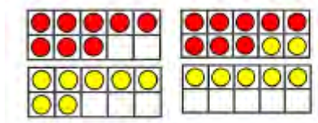


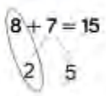

- Feely bag addition with Numicon:



- Numicon Balance

- Use of counters and 10-frames





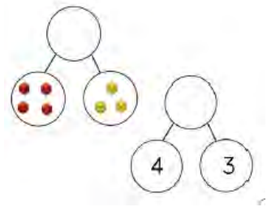

- Use of Concrete bar model concrete using real objects or post it notes

*Discrete– use 7 strips of paper*
*Continuous – two different lengths of paper eg. 3 + 4*

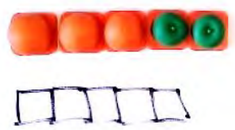
- Worded problems using concrete objects
*"There are 8 cars. 2 more come long."*

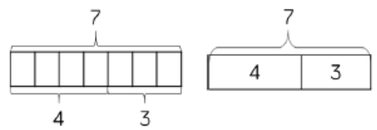
## Pictorial

- Pictorial representation of Part Part Whole

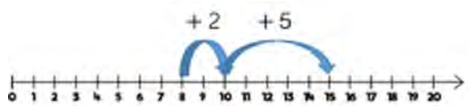



- Bar Models (Discrete and Continuous)






- Counting on through use of number lines


## Abstract

- Use of addition and equals signs to create simple number sentences

$8 + 7 = 15$

**Oracy Sentence Stems:**

____ add ____ is equal to____

The whole is ____. The parts are ____ and ____

To find the unknown part/whole I need to____

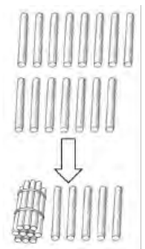
## Guidance

Use of number sentences and mathematical language - count on / altogether / one more/ two more/add all together/addend/sum*
*sum = add only

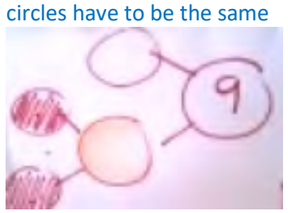
Series of questions for adding:
8 + 2 + 5
8 + 7

Use patterns and bonds
7+8
Near doubles adding
6+6
6+7

When adding one-digit numbers that cross 10, it is important to highlight the importance of ten 1s equalling one 10.



**Extension**
Making 9 by adding numbers in the circles. Numbers in the red circles have to be the same

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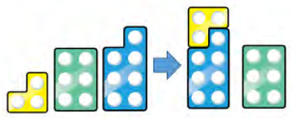
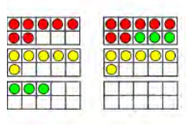
# Year 2 - Addition

## Concrete

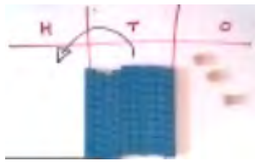
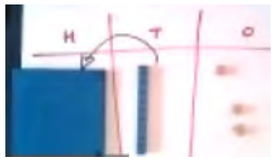
- Continued use of Numicon and 10s frames

- Part Part Whole models using Base 10

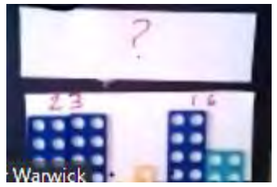
- Addition of 10s using Base 10 *eg. 43 + 10*


- Moving to exchanging across tens and hundred
  *eg. 93 + 10*

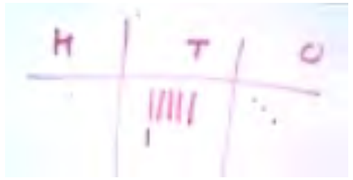
- Base 10 and Cuisenaire Number Tracks for adding 10s
  *e.g 13 + 10 and 23 + 20*


- Concrete bar models using Numicon and Base 10

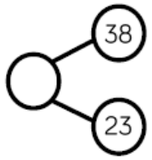



## Pictorial

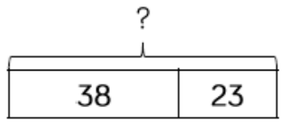
- Pictorial representations of Base 10



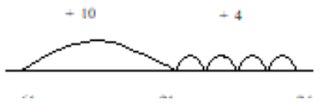

- Part Part Whole Models




- Bar Models (Continuous)



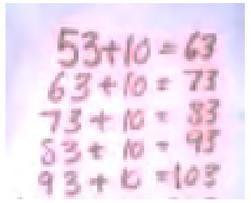

- Partitioning into 10s and 1s using number lines




## Abstract

- Use of addition and equals signs to write number sentences of bonds up to 20 and derive fact families
  *eg. 13 + 7 = 20*
  *7 + 13 = 20*
  *Link to subtraction:*
  *20 – 7 = 13*
  *20 - 13 = 7*

- Recognise Patterns in Addition Number Sentences




**Oracy Sentence Stems:**

The picture tells me I need to add the numbers.

The parts are known/unknown.

The whole is known/unknown.

I can partition ____ into ____ and ____.

____ ones/tens add ____ ones/tens is equal to ____.

I will exchange one ten for ten ones.

____ add ____ is equal to____

## Guidance

Adding 10 to a number
Adding 20 to a number

Start addition with no regrouping, and gradually build up to regrouping through 10, 50 and 100

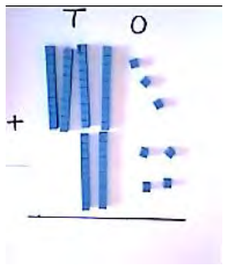
**Non-Statutory Guidance from the National Curriculum:**
***Recording addition in columns supports place value and prepares for formal written methods with larger numbers***
***(See Year 3 CPA examples)***

# Year 3 - Addition

## Concrete

- Use of Base 10 for addition up to 3 digits

No exchange *eg. 43 + 24*

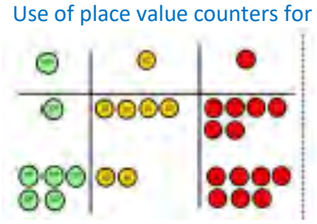



Exchanging with ones only *eg. 45 + 26*


Exchanging tens only *eg. 55 + 64*


Porgressing to: Exchanging hundreds only and exchanging ones and tens

- Use of place value counters for same progressions

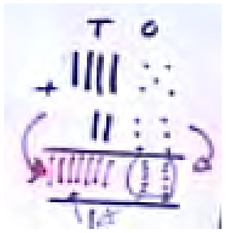


## Pictorial

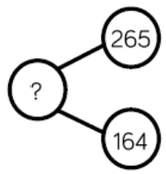
- Pictorial representation of base 10 and exchanging

eg. 43 + 24

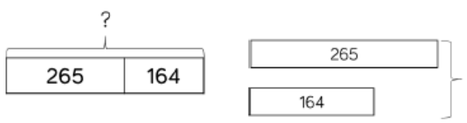

eg. 45 + 46



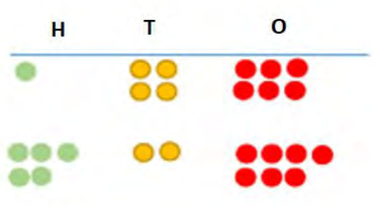

- Part Part Whole Models




- Bar Models (Part Part Whole and Comparison)



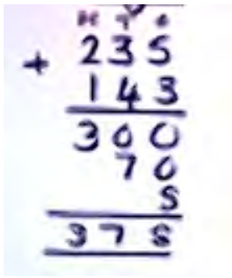

- Pictorial Representation of place value counters




## Abstract

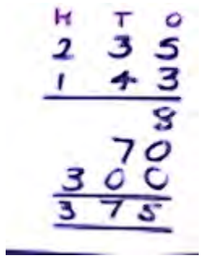
- Introduced expanded columnar addition

Most Significant Digit



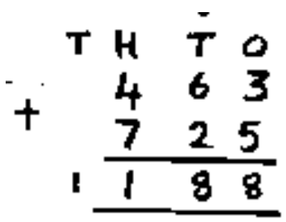

**supports mental calculation*

Least Significant Digit




**supports formal addition*

- Formal Columnar Addition* (follow same progression as with concrete examples)




***Exchanged amounts should be noted at the bottom of the calculation**

**Oracy Sentence Stems:**
The calculation tells me I need to add the numbers.
If the column total is equal to ten or more we must exchange.
I will exchange one hundred for ten tens.
____ ones/tens/hundred add ____ ones/tens/hundred is

## Guidance

Children should record their written calculations using H T O to reinforce the place value of each digit in the sum.

To add successfully, children need to be able to:

- Recall all addition pairs to 9 + 9 and complements in 10; bonds to 100
- Add mentally a series of one-digit numbers, such as 5 + 8 + 4
- Add multiples of 10 (such as 60 + 70) and 100 (such as 600 + 700) using the related addition fact, e.g. 6 + 7, and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways. e.g. 52 = 50 + 2, 40 + 12, 30 + 22

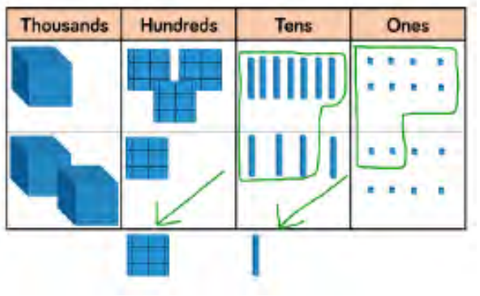
It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for addition.

Children should record their written calculations using H T O to reinforce the place value of each digit in the calculation.

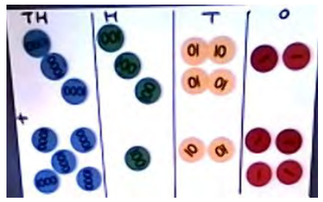
# Year 4 - Addition

## Concrete

- Use of Base 10 up to 4 digits




- Use of place value counters for columnar addition




- Use of place value counters for Bar Models (continuous)

**Oracy Sentence Stems:**

The calculation tells me I need to add the numbers.

If the column total is equal to ten or more we must exchange.

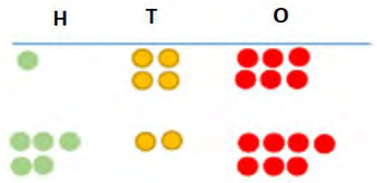
I will exchange one hundred for ten tens.

____ add ____ is equal to____

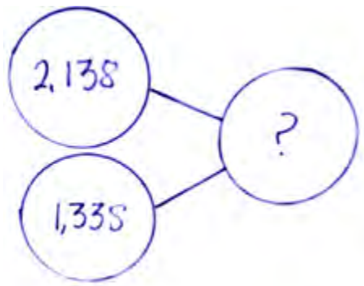
____ thousand add ____ thousand is equal to ____. equal

## Pictorial

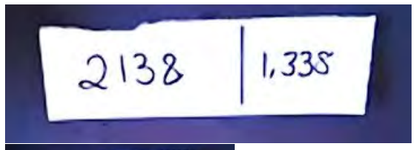
- Pictorial Representation of Base 10 and place value counters

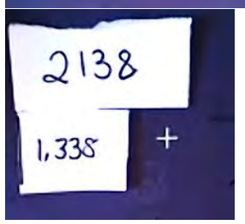



- Part Part Whole Models




- Bar Modelling (Part Part Whole and Comparison)

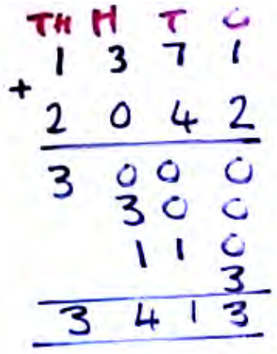



## Abstract

- Continue with expanded columnar addition

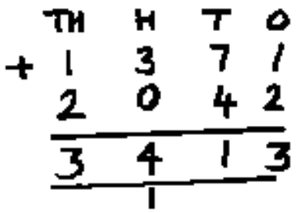
Most significant digit



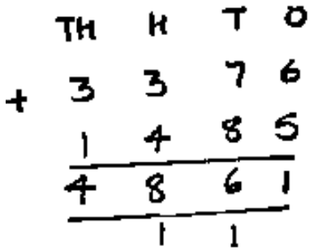

Least significant digit


- Continue with Formal Columnar Addition

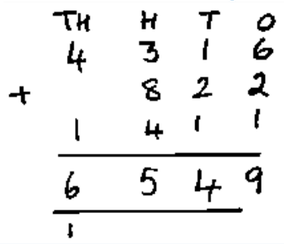
Exchange tens to hundreds




Exchange ones to tens and tens to hundreds




Different Number of Digits

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- Recall all addition pairs to 9 + 9 and complements in 10; bonds to 100
- Add mentally a series of one-digit numbers, such as 5 + 8 + 4
- Add multiples of 10 (such as 60 + 70) and 100 (such as 600 + 700) using the related addition fact, e.g. 6 + 7, and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways. e.g. 52 = 50 + 2, 40 + 12, 30 + 22

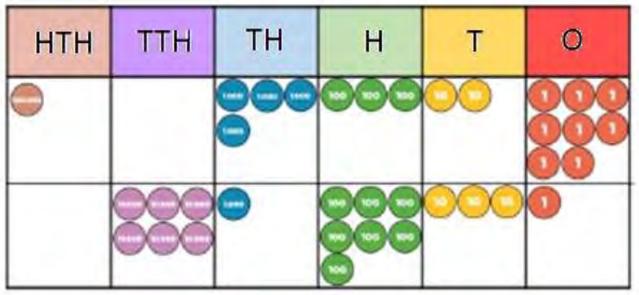
It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for addition.

Children should record their written calculations using TH H T O to reinforce the place value of each digit in the calculation.

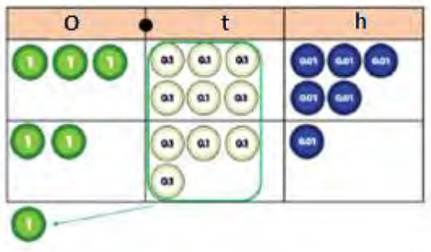
# Year 5 - Addition

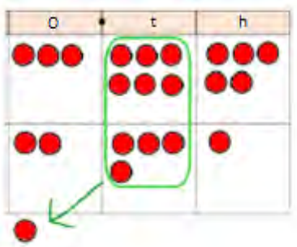
## Concrete

- Use of Base 10 and place value counters for addition up to 6 digits



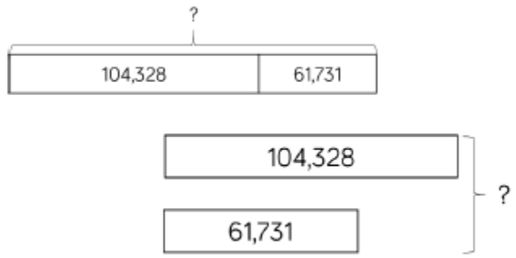

- Use of place value counters for decimal addition using tenths and hundredths



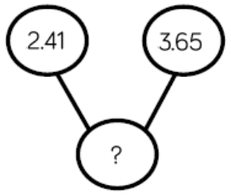




## Pictorial

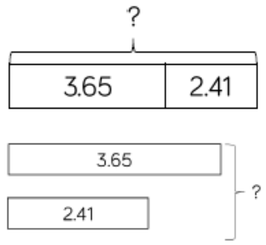
- Bar Models (Part Part Whole and Comparison)




- Part Part Whole Model for Decimal Addition

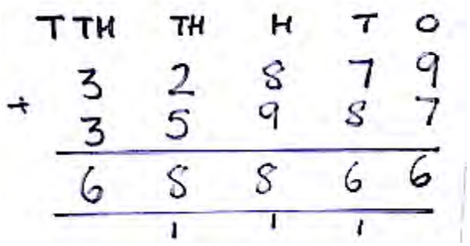



- Bar Models (Part Part Whole and Comparison) for Decimal Addition



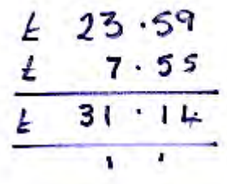

## Abstract

- Columnar Formal Addition up to 6 digits




- Columnar Addition for Decimal Addition up to Tenths and Hundreds


- Columnar Addition of Money




**Oracy Sentence Stems:**

The most efficient way to add these numbers is by ____ because ____

____ tens add the ____ we already have, gives us ____

The calculation tells me I need to add the numbers.

If the column total is equal to ten or more we must exchange.

I will exchange one hundred for ten tens.
____ thousands add ____ thousands is equal to ____.

## Guidance

To add successfully, children need to be able to:

- Recall all addition pairs to 9 + 9 and complements in 10; bonds to 100
- Add mentally a series of one-digit numbers, such as 5 + 8 + 4
- Add multiples of 10 (such as 60 + 70) and 100 (such as 600 + 700) using the related addition fact, e.g. 6 + 7, and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways.
  e.g. 52 = 50 + 2, 40 + 12, 30 + 22

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for addition.

Children should record their written calculations using HTH TTH TH H T O to reinforce the place value of each digit in the calculation.

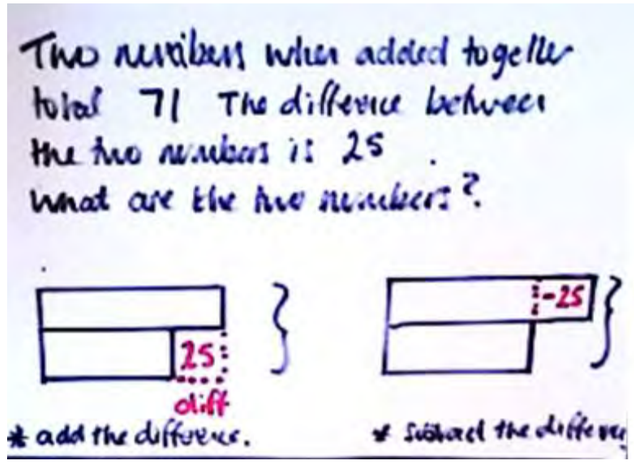
# Year 6 - Addition

## Concrete

- As above

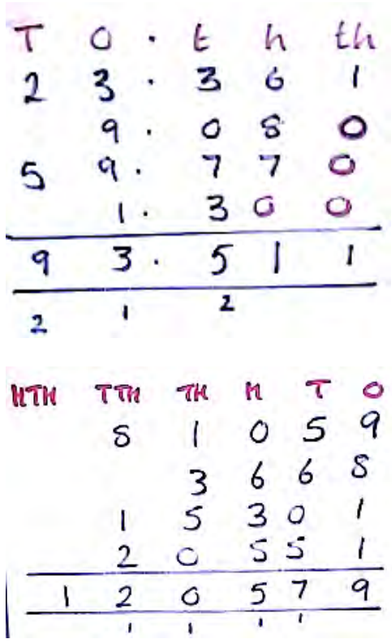
## Pictorial

- Bar Models for Increasingly Complex Multi-Step Problems




## Abstract

- Add several numbers of increasing complexity using Formal Columnar Addition




**Oracy Sentence Stems:**

The most efficient way to add these numbers is by ____ because ____

The calculation tells me I need to add the numbers.

If the column total is equal to ten or more we must exchange.

____ million add ____ million is equal to ____.

When there are no brackets, division is completed before addition and subtraction.

## Guidance

To add successfully, children need to be able to:

- Recall all addition pairs to 9 + 9 and complements in 10; bonds to 100
- Add mentally a series of one-digit numbers, such as 5 + 8 + 4
- Add multiples of 10 (such as 60 + 70) and 100 (such as 600 + 700) using the related addition fact, e.g. 6 + 7, and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways. e.g. 52 = 50 + 2, 40 + 12, 30 + 22

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for addition.

Children should record their written calculations using M HTH TTH TH H T O to reinforce the place value of each digit in the calculation.

# SUBTRACTION

**SUBTRACT MINUS -- TAKEWAY FEWER THAN DIFFERENCE LESS DECREASE**

# EYFS - Subtraction

## Concrete

- Counting backwards in 1's, 2's and 5s and 10's using stories, rhymes and songs eg. 5 little monkeys

- Squash Numicon into playdough and cut parts off – what's left?

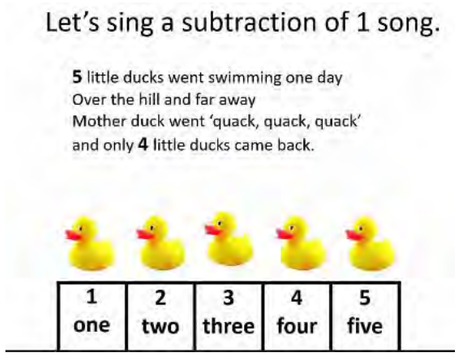

- Numicon and objects – children physically remove 1

- 5 frames: One less
- Progressing to 10 frames


(Both Five–wise and Pair-wise)

## Pictorial

- Counting backwards in 1's, 2's and 5s and 10's using stories, rhymes and songs eg. 5 little ducks



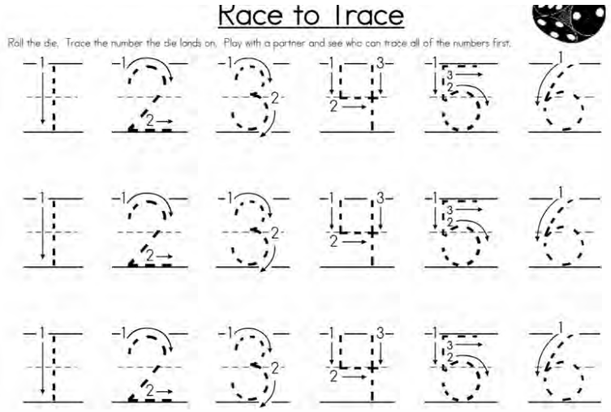

- Children's mark making
- Pictorial representations of real objects for worded questions:


- Games – "One fewer" with die game

## Abstract

- Counting backwards in 1's, 2's and 5s and 10's using stories, rhymes and songs eg. 5 little ducks

- Begin to recognise numerals up to 5.




**Oracy Sentence Stems:**

I start with ____ and takeaway _____ there is _____ left.

There are _____ fewer items.

## Guidance

Digit dog challenges

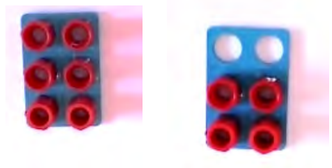
"Fewer" to be used when the items are countable

Use fairy tales to look at counting

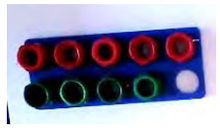
# Year 1 - Subtraction

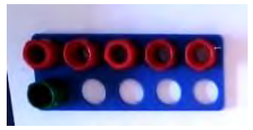
## Concrete

- Squash Numicon into playdough and cut parts off – what's left? (see EYFS subtraction)
- Numicon and objects
  eg. 6 – 2



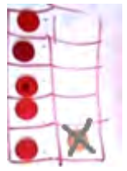
eg. 9 – 3 = 6





- 5 frames

- Progressing to 10 frames



(Both Five–wise and Pair-wise)

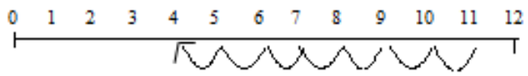
- Chalk out number lines to count back on physically

- Number tracks

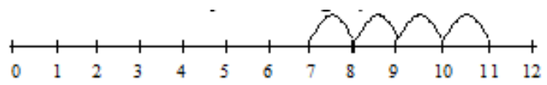
- Concrete Bar Models using real life objects (Comparison)

## Pictorial

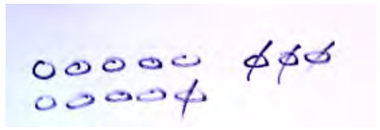
- Drawing jumps on prepared number lines eg. 11 - 7




- Find difference by counting up number lines




- Pictorial representations of objects crossed out



- Drawn Bar modelling from concrete objects (discrete)

- Provide children with squares with pictures of objects onto glue and stick discrete bar models and then cross out

## Abstract

- Use of fingers
  eg. Put 13 in your head, count back 4. What number are you at?
- Number sentences using – and =
- Subtract multiples of 10 eg. 50 – 20 = 30
- Relationships/Related facts (Summer Term)

Relationships/ Related Facts

| | |
|---|---|
| 5 - 2 = □ | □ = 5 - 2 |
| 5 - □ = 3 | 3 = □ - 2 |
| □ - 2 = 3 | 3 = 5 - □ |
| □ - □ = 3 | 3 = □ - □ |

**Oracy Sentence Stems:**

____ subtract____ is equal to ____

When we subtract, we start with the whole.

The whole is ____. The parts are ____ and ____

To find the unknown part/whole I need to____

The difference between ____ and ____ is ____

## Guidance

To develop bar modelling:

Work on the same, before working on difference:

*eg. There are 3 boys in the class, there are the same amount of girls. How many girls are there?*

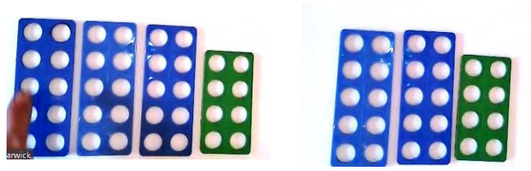
*There are 6 boys in the class, and 4 girls. Find the difference between the number of girls and boys.*

Physically do this with children standing on A3 paper to represent bars.

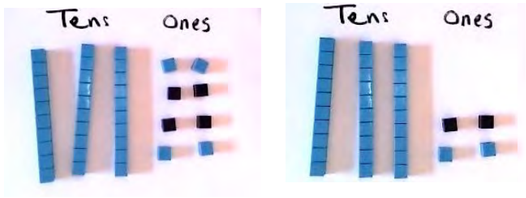
# Year 2 - Subtraction

## Concrete

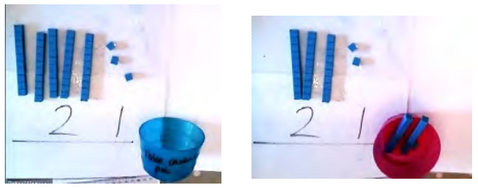
- Numicon (Subtracting 10s)



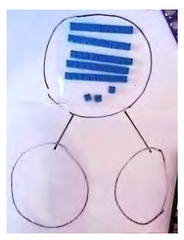
- Base 10 (Subtracting 10s and subtracting 1s)




- Base 10 or place value counters with "Takeaway Pot"

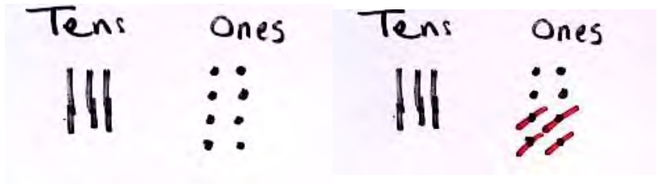


- Introduce the concept of exchange through moving objects physically

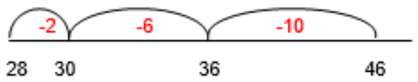


## Pictorial

- Pictorial representation of Base 10

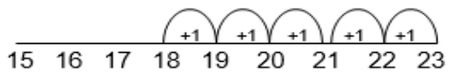



- Counting back by partitioning when numbers aren't close together eg. 46 - 18

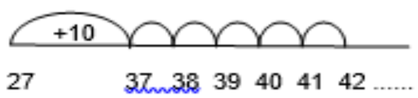



- Find the difference (subtraction) by counting on

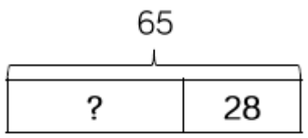
eg. 23 – 18 - 5




eg. 42 – 27 (add multiples of 10 first)




- Continuous Bar models




## Abstract

- Bonds to 20
- Derive facts families

13 + 7 = 20
7 + 13 = 20
20 – 7 =13
20 - 13 = 7

**Oracy Sentence Stems:**

The picture tells me I need to subtract the numbers.

The parts are known/unknown.

The whole is known/unknown.

I can partition ____ into ____ and ____.

____ ones/tens add ____ ones/tens is equal to ____.

I will exchange one ten for ten ones.

____ subtract____ is equal to ____

When we subtract, we start with the whole

____ and ____ have a difference of _____

____ and ____ have a difference of ____

## Guidance

Recognise and use the inverse relationship between addition and Subtraction.

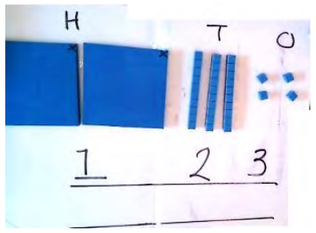
Show that subtraction is not commutative (done in any order)

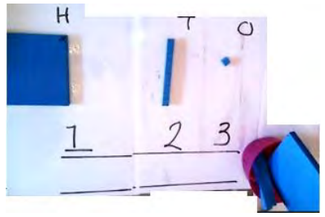
**Non-Statutory Guidance from the National Curriculum:**
***Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers***
***(See Year 3 CPA examples)***

# Year 3 – Subtraction

## Concrete

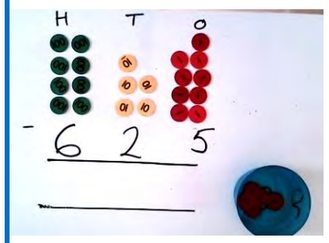
- Use of Base 10 Takeaway Pot

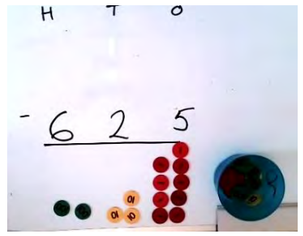


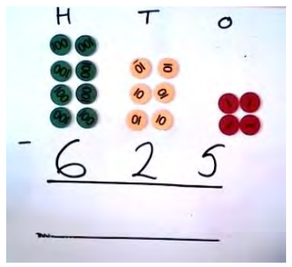

- Use of place value counter and Takeaway Pot

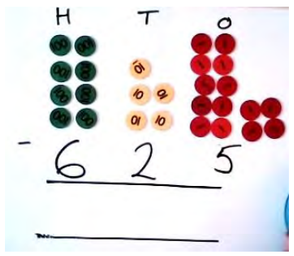
Without Exchange eg. 859 - 625



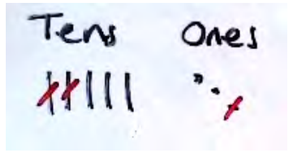

With Exchange in 1s Column eg. 864 - 625



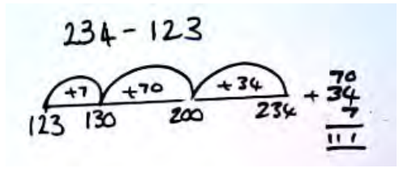




## Pictorial

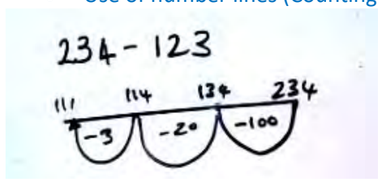
- Pictorial representations of Base 10 and place value counters



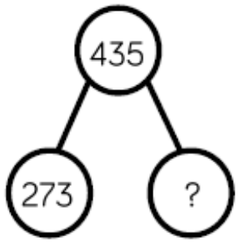

- Use of number lines (Counting On)



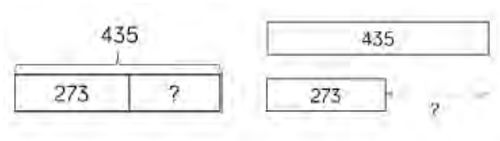

- Use of number lines (Counting Back)




- Part Part Whole Models



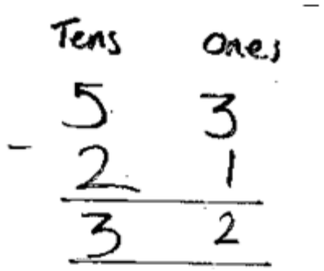

- Bar Models (continuous)

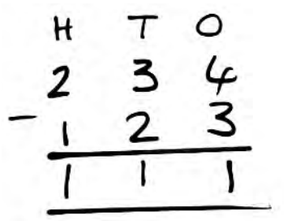



## Abstract

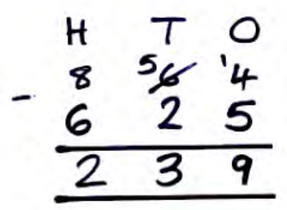
- Formal Columnar Subtraction

No Exchange (2 Digits and 3 Digits)

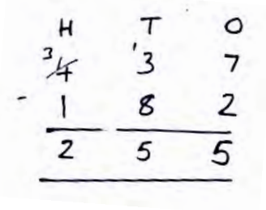


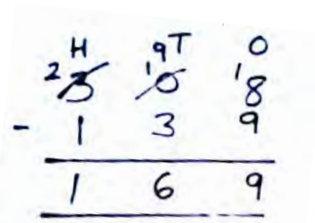

Exchange 10s

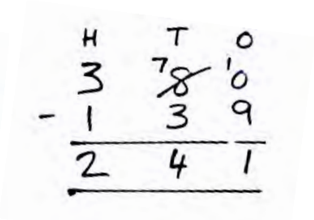



Exchange 100s




Introduction of 0s




**Oracy Sentence Stems:**

The calculation tells me I need to subtract the numbers.

Whole subtract a part is equal to the difference.

I will exchange one ten for ten ones

I will exchange one hundred for ten tens.

____ subtract____ is equal to ____

When we subtract, we start with the whole.

## Guidance

To subtract successfully, children need to be able to:
- Recall subtraction facts to 20
- Subtract multiples of 10 (such as 160 – 70) using the related subtraction fact 16 – 7 and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into 70 + 4 or 60 + 14).

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

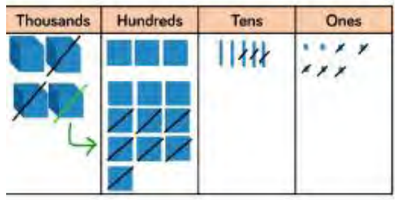
Children should be presented with calculations horizontally to practise setting out the vertical columnar method.
eg. 300 -11 or 300 – 111

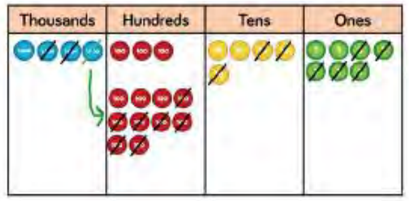
Children should record their written calculations using H T O to reinforce the place value of each digit in the calculation.

# Year 4 – Subtraction

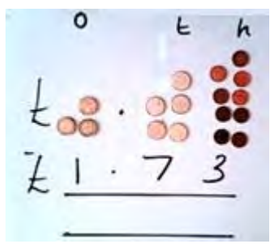
## Concrete

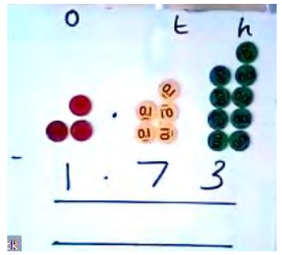
- Base 10 progressing to place value counters (1 exchange moving to 2 exchanges) for 4 digits



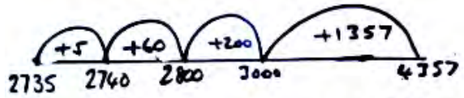

- Coins and place value counters for decimal subtraction

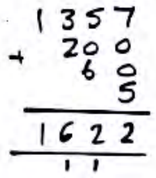


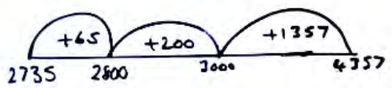

## Pictorial

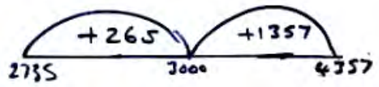
- Use of number lines (counting on)



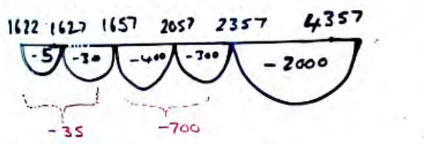




Progressing to larger jumps

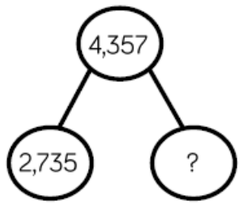


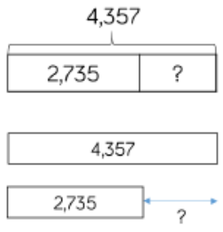

- Use of number lines (counting back)




- Part Part Whole Models



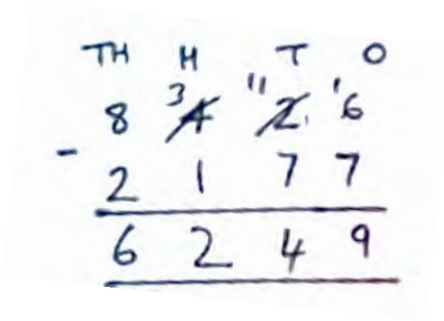

- Bar Models (Part Part Whole and Comparison)



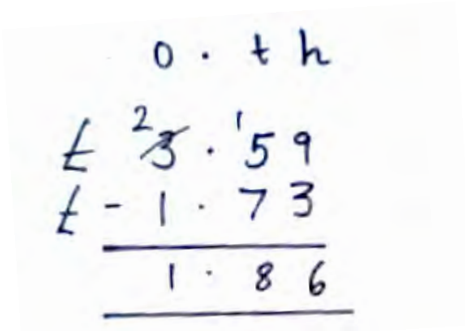

## Abstract

- Formal Columnar Subtraction

Revisit Year 3 subtraction steps, progressing to 2 exchanges for 4 digits




- Decimal subtraction (money)




**Oracy Sentence Stems:**

The calculation tells me I need to subtract the numbers.

If the column total is equal to ten or more we must exchange.

Whole subtract a part is equal to the difference.

I will exchange one hundred for ten tens.

When we subtract, we start with the whole

tenths/hundredths subtract

## Guidance

To subtract successfully, children need to be able to:
- Recall subtraction facts to 20
- Subtract multiples of 10 (such as 160 – 70) using the related subtraction fact 16 – 7 and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into 70 + 4 or 60 + 14).

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

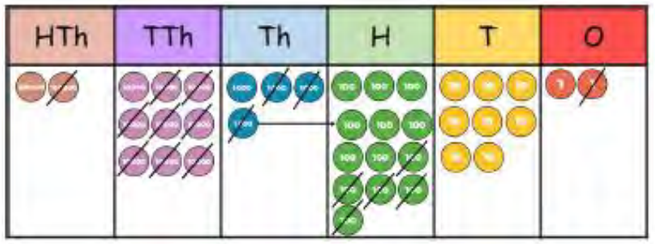
Children should be presented with calculations horizontally to practise setting out the vertical columnar method.
eg. 300 - 11 or 300 – 111

Children should record their written calculations using TH H T O to reinforce the place value of each digit in the calculation.

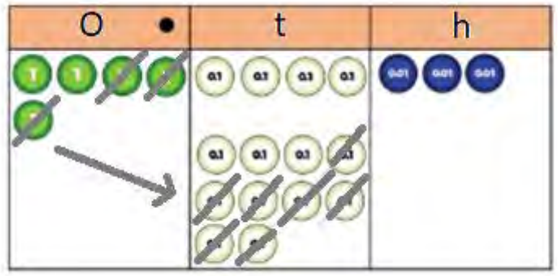
# Year 5 – Subtraction

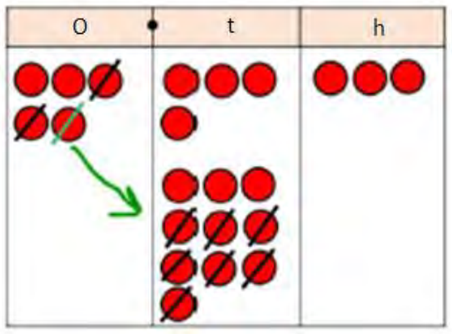
## Concrete

- Place Value Counters up to 6 digits with multiple exchanges



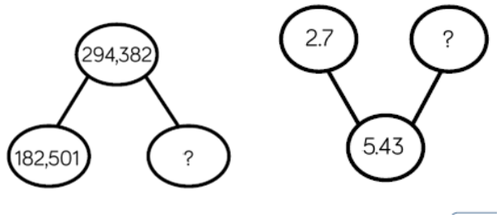

- Place Value Counters up to 2dp



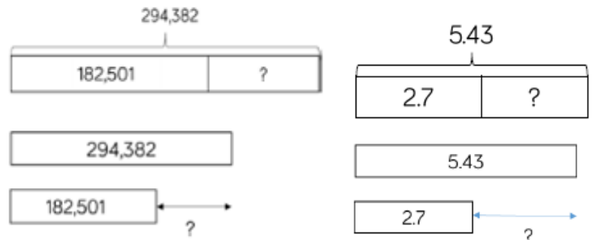




## Pictorial

- Part Part Whole Models




- Bar Models (Part Part Whole and Compasrion)




**Oracy Sentence Stems:**

To subtract ____ from ____ I can partition ____ into ____

The calculation tells me I need to subtract the numbers.

If the column total is equal to ten or more we must exchange.

Whole subtract a part is equal to the difference.

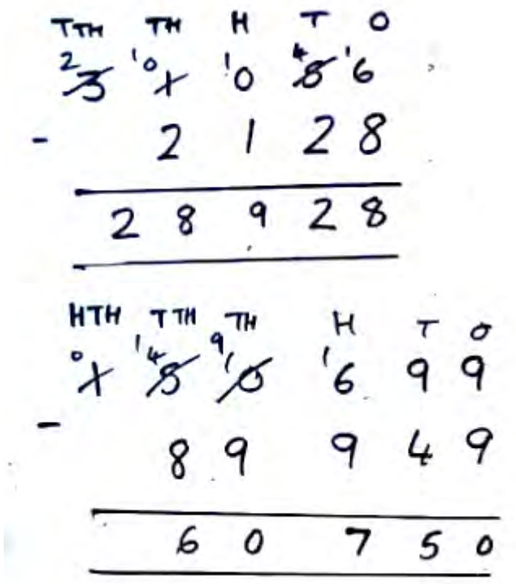
I will exchange one hundred for ten tens.

____ thousandths subtract ____ thousandths is equal to ____.

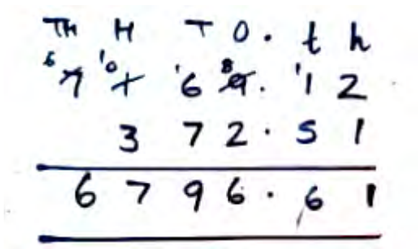
## Abstract

- Formal Columnar Subtraction

6 Digit with multiple exchanges




Decimal up to 2dp




## Guidance

To subtract successfully, children need to be able to:
- Recall subtraction facts to 20
- Subtract multiples of 10 (such as 160 – 70) using the related subtraction fact 16 – 7 and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into 70 + 4 or 60 + 14).

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

Children should be presented with calculations horizontally to practise setting out the vertical columnar method.
eg. 300 - 11 or 300 – 111

Children should record their written calculations using HTH TTH TH H T O to reinforce the place value of each digit in the calculation.

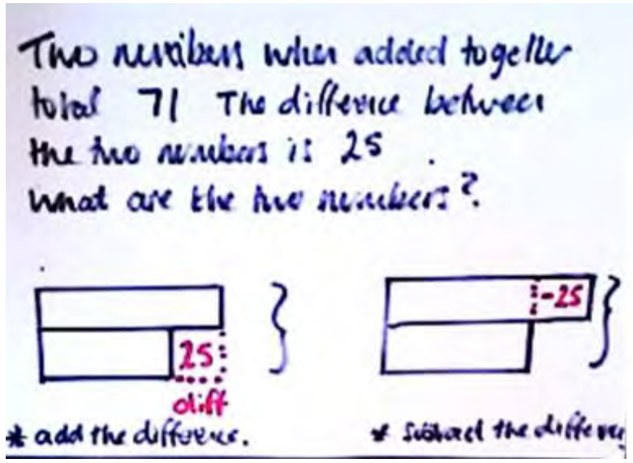
# Year 6 – Subtraction

## Concrete

- As Above

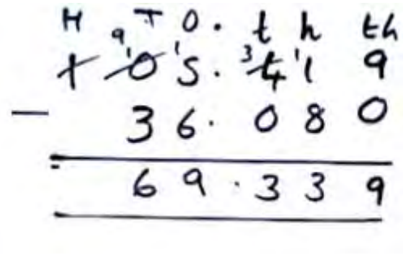
## Pictorial

- Bar Models for Increasingly Complex Multi-Step Problems




## Abstract

- Formal Columnar Subtraction up 7 digits




**Oracy Sentence Stems:**

When there are no brackets, division is completed before addition and subtraction.

The most efficient way to subtract these numbers is by ____ because ____

The calculation tells me I need to subtract the numbers.

If the column total is equal to ten or more we must exchange.

____ million subtract ____ million is equal to ____.

## Guidance

To subtract successfully, children need to be able to:

- Recall subtraction facts to 20
- Subtract multiples of 10 (such as 160 – 70) using the related subtraction fact 16 – 7 and their knowledge of place value
- Partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into 70 + 4 or 60 + 14).

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

Children should be presented with calculations horizontally to practise setting out the vertical columnar method.
eg. 300 - 11 or 300 – 111

Children should record their written calculations using M HHT TTH TH H T O t h th to reinforce the place value of each digit in the calculation.

# MULTIPLICATION

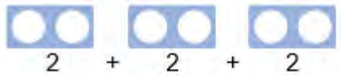
**MULTIPLY TIMES X PRODUCT BY AREA DOUBLE TWICE TRIPLE OF**

# EYFS – Multiplication

## Concrete

- Understand concept and vocabulary of multiplication (groups of, multiplied by, x times) through practical activities in meaningful contexts
  eg. How many wheels do we need to make 3 Noddy cars?

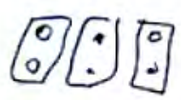
- Grouping objects in twos or threes, then adding groups of the same number



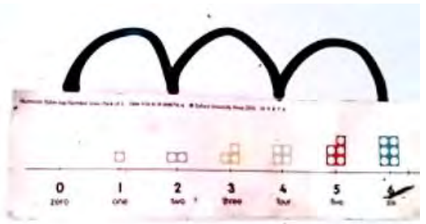

- Begin to use number lines/tracks/PE ladders (frogs)
- Doubles and pairs
- Numicon Feely Bag – Take out two of the same
- Numicon spinner game (1- 5)

## Pictorial

- Children's mark making

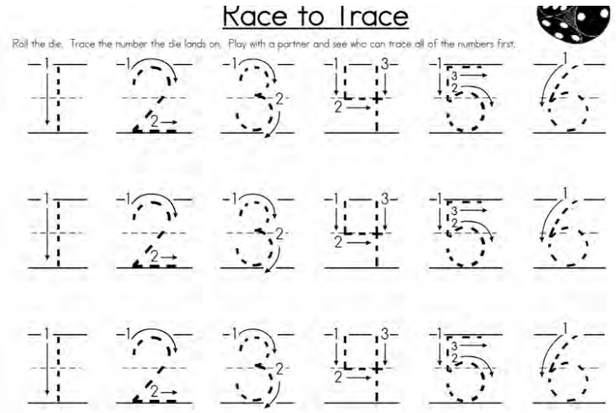


- Jumps on a number line




## Abstract

- Being able to count in 2 and 10 by rote
- Begin to write down answers to number sentence stems
- Begin to write "Doubles 2 = "




**Oracy Sentence Stems:**

**____ groups of____ are equal to____**

**The pattern is increasing in ____**

**Double ____ is _____**

## Guidance

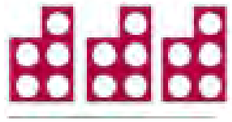
Children can write 2 + 2 + 2 = 6

Make use of pairs in illustrations
eg. Cinderella's shoes
Noah's Ark

# Year 1 – Multiplication

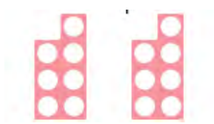
## Concrete

- Use different objects to add equal groups

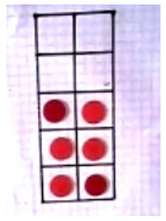



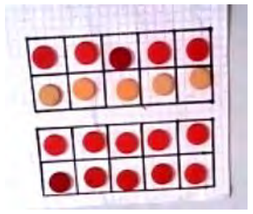
- Counting in multiples of 2p, 5p and 10ps


- Numicon Doubles up to 10 + 10



- Use of arrays and 10s frame to count in multiples of 2s, 5s and 10s





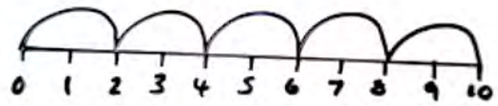
- Jumping on chalk number lines

## Pictorial

- Pictorial representation of groups of concrete objects

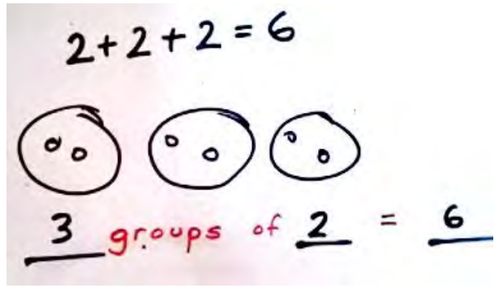
There are 2 sweets in one bag. How many sweets are there in 5 bags?

- Use of number lines




## Abstract

- Repeated addition sentences of concrete objects and pictures




**Oracy Sentence Stems:**

____ groups of____ are equal to____

The pattern is increasing in ____

There are ____ groups of ten. There are ____ ones.

____ groups of ten are equal to ____

____ groups of two are equal to ____

____ groups of five are equal to ____

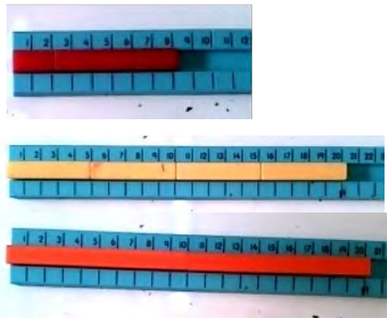
## Guidance

# Year 2 – Multiplication

## Concrete

- Use of arrays to show multiplication sentences

- Cuisenaire tracks (2s, 5s, 10s)

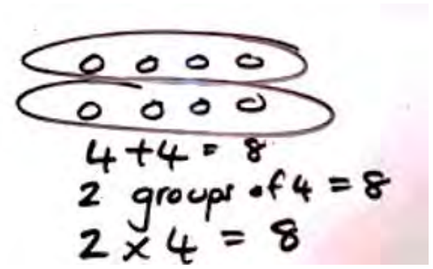


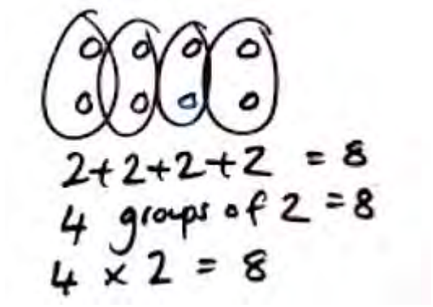
- Doubles of all numbers up to 20 by partitioning and recombining eg. 17 + 17


- Jumping on Chalk Number Lines

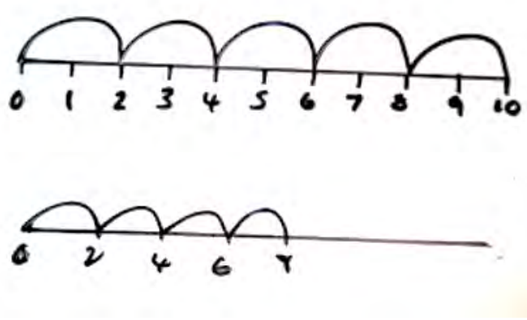
## Pictorial

- Drawn arrays in different rotations (to show commutativity)



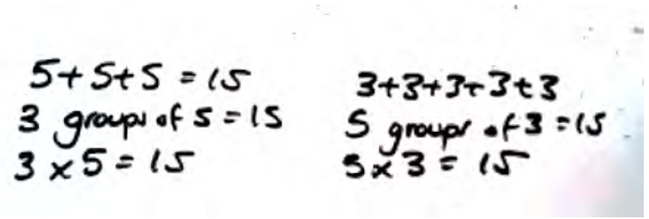




- Use of number lines (discrete moving to continuous)




## Abstract

- Number sentences of repeated addition moving to use of x symbol




**Oracy Sentence Stems:**

There are ____ parts with a value of ____.

The whole is ____.

____ groups of ____ is equal to ____.

____ multiplied by ____ is equal to ____.

## Guidance

By the end of Year 2, children must know the times tables facts for 2, 5 and 10.

Children should be secure with the concept that the multiplication of two numbers can be done in any order (commutative).

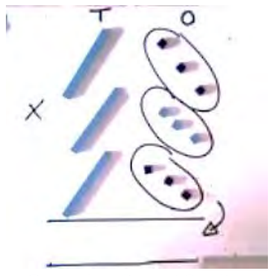
# Year 3 – Multiplication

## Concrete

- Cuisenaire tracks to show multiples of numbers

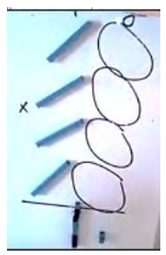
- Area Method: Cuisenaire on Squared Paper
eg. 13 x 4

- Grouping Base 10 and Place Value Counters





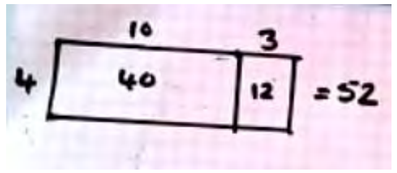
- Grouping Base 10 with exchange of 1s

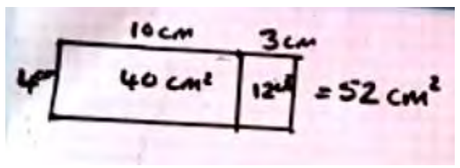





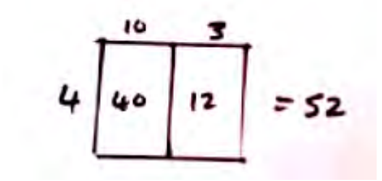

## Pictorial

- Area Method: Drawn on squared paper (draw round Cuisenaire)
eg. 13 x 4

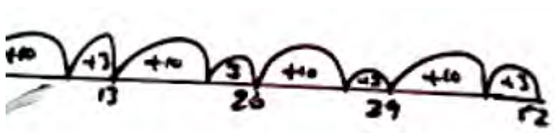



- Grid Method (Area not to scale)




- Jumps on number lines




**Oracy Sentence Stems:**

To find ten times as many, multiply by ten.

____ is a multiple of ____ because ____

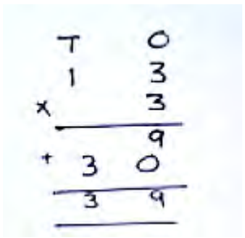
____ multiplied by ____ is equal to ____.

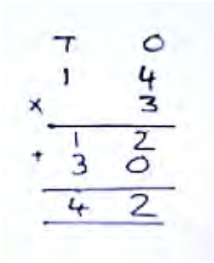
Products in the ____ time table are also in the ____ time table.
When we multiply, the parts are known but the whole is unknown.

____ x ____ is the same as ____ groups of ____

## Abstract

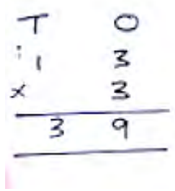
- Expanded Columnar Multiplication



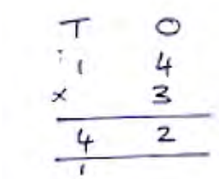




- Formal Columnar Multiplication (Use a multiplier from times tables children are secure with)

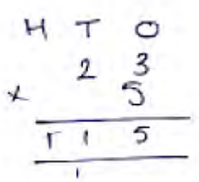
2 digit by 1 digit (no exchange)




2 digit by 1 digit (exchange)




2 digit by 1 digit (3 digit answer)




## Guidance

To multiply successfully, children need to be able to:

- Recall multiplication facts to 10 x 10
- Partition numbers into multiples of 100, 10 and 1
- Work out products such as 70 x 5, 70 x 50, 700 x 5 or 700 x 50 using the related fact 7 x 5 and their knowledge of place value
- Add two or more single-digit numbers mentally
- Add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact, 6 + 7, and their knowledge of place value
- Add combinations of whole numbers using the column method

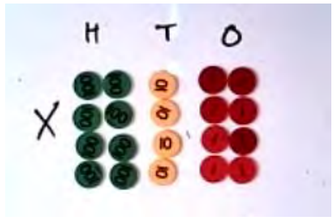
It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.

**Children should record their written calculations' using H T O to reinforce the place value of each digit in the calculation.**

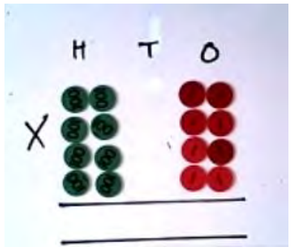
# Year 4 – Multiplication

## Concrete

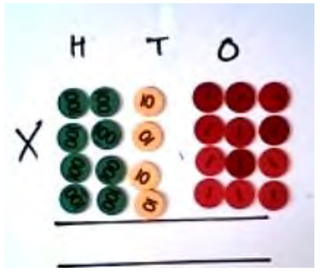
- Use of Base 10 and Place Value counters for 3 digits by 1 digit
  eg. No exchange (212 x 4)




eg. Use of 0 (202 x 4)

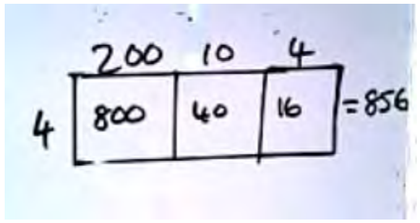



eg. Exchange (214 x 4)

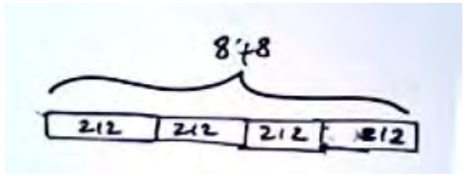



## Pictorial

- Area Method progressing to Grid Method




- Bar Models (Part Part Whole)




**Oracy Sentence Stems:**

When zero is a factor, the product is zero.

For every group of one twelve, there are two groups of six.

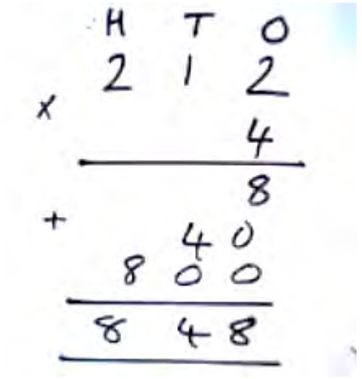
All multiples of tens have a ones digit of zero.

Products in the ____ time table are also in the ____ time table.

All multiples of one hundred have both a tens and ones digit of zero.

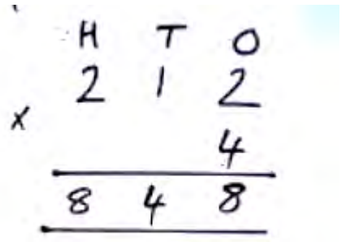
## Abstract

- Expanded Columnar Multiplication

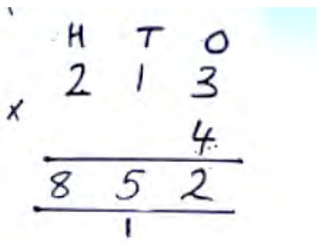



- Formal Columnar Multiplication

3 digits by 1 digit (no exchange)




3 digit by 1 digit (1 and 2 exchange)




## Guidance

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- Partition numbers into multiples of 100, 10 and 1
- Work out products such as 70 x 5, 70 x 50, 700 x 5 or 700 x 50 using the related fact 7 x 5 and their knowledge of place value
- Add two or more single-digit numbers mentally
- Add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact, 6 + 7, and their knowledge of place value
- Add combinations of whole numbers using the column method

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.

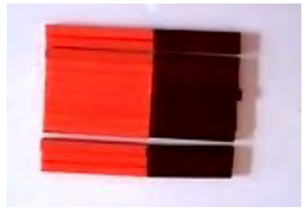
**Children should record their written calculations' using H T O to reinforce the place value of each digit in the calculation**

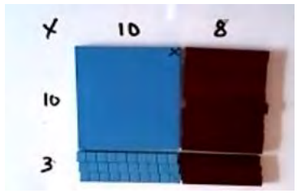
# Year 5 – Multiplication

## Concrete

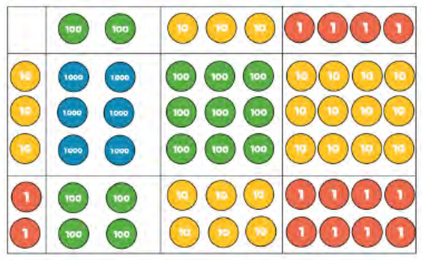
- Place Value counters for 4 digits by 1 digit
  eg. 1826 x 3 = 5478

- Cuisenaire Rods and Base 10 for Area method: 3 digits by 2 digits
  eg. 13 x 18



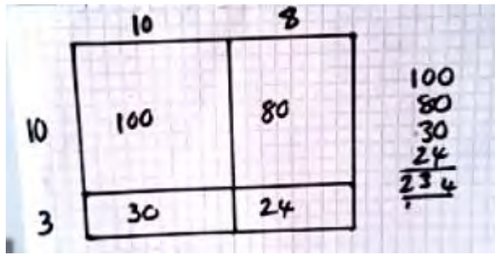


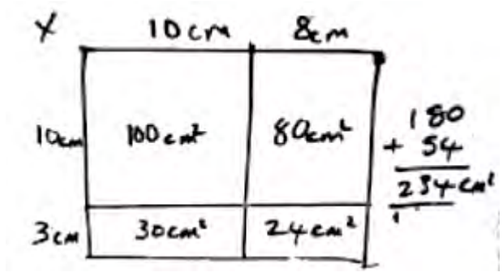

- Place Value Counters for Grid Method: 3 digits by 2 digits
  eg. 234 x 32



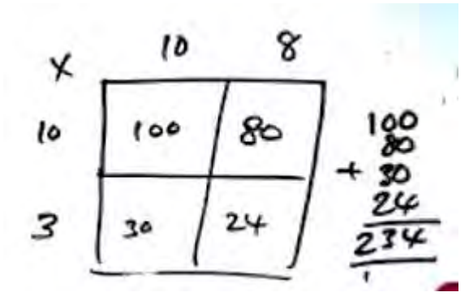
## Pictorial

- Area Method for 2 digits by 2 digits (draw round Cuisenaire
  eg. 23 x 18



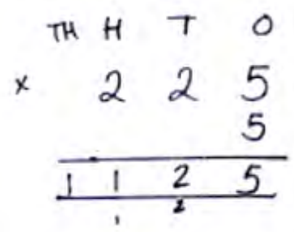

- Grid Method for 2 digits by 2 digits (not to scale)



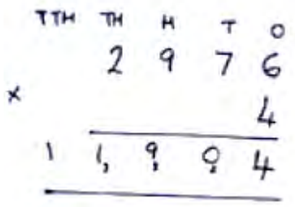

## Abstract

- Formal Columnar Multiplication

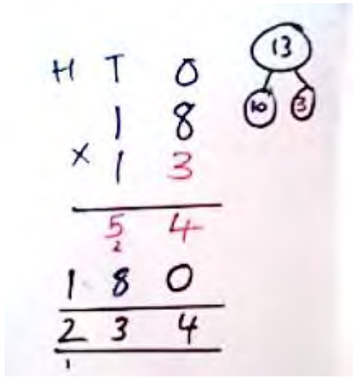
3 digit by 1 digit




4 digit by 1 digit




3 digit by 2 digit




## Guidance

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- Add combinations of whole numbers using the column method

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.

**Children should record their written calculations' using TH H T O to reinforce the place value of each digit in the calculation**

**Oracy Sentence Stems:**

____ is a factor/multiple of ____ because ____ x ____ = ____

____ is a factor/multiple of ____ because ____ ÷ ____ = ____

Numbers that have more than two factors are composite numbers.

Numbers that have only two factors are called prime numbers.

____ is not prime because it has the factors ____

____ is prime because it only has two factors: 1 and itself.

____ squared is ____. The square root of ____ is ____.

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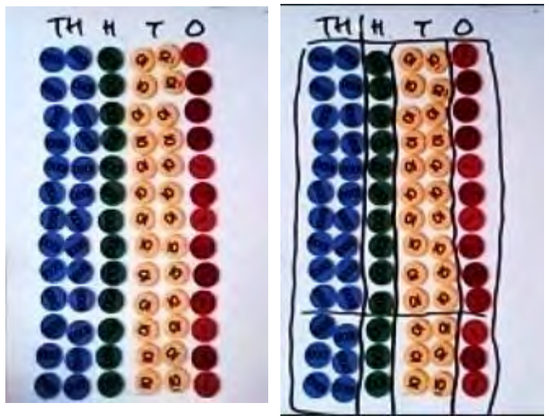
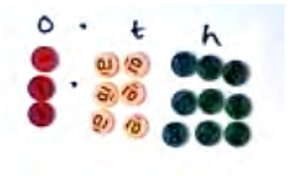
# Year 6 – Multiplication

## Concrete

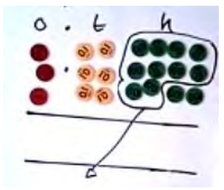
- Place Value Counters for Grid Method: 4 digits by 2 digits
eg. 2121 x 13




- Place Value Counters for Grid Method: Decimals
eg. 1.23 x 3 (no exchange)

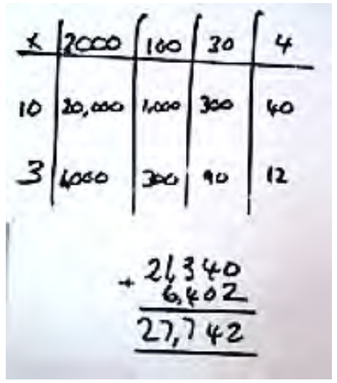



eg. 1.24 x 4 (exchange)




## Pictorial

- Grid Method
eg. 2134 x 13




**Oracy Sentence Stems:**

If ____% of my number is ____, then I need to multiply it by ____ to find the full amount.

When a number is multiplied by ____ the digits move ____ places to the ____

When a number is multiplied by one thousand, the digits move three places to the left.

If one factor is made ten times the size, the product will be ten times the size.

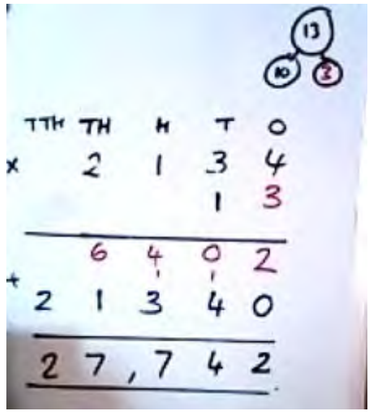
If I double one factor, I must double the product.

If I multiply one factor by ____, I must multiply the product by ____

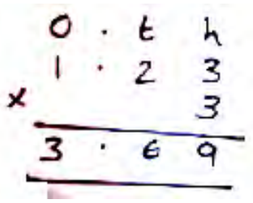
## Abstract

- Formal Columnar Multiplication

4 digit by 2 digit




Decimal




## Guidance

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- Add combinations of whole numbers using the column method

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**Children should record their written calculations' using TTH TH H T O t h to reinforce the place value of each digit in the calculation**

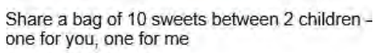
# DIVISION

**DIVIDE EQUAL PARTS ÷ HALF OF GOES INTO QUOTIENT RATIO / ------**

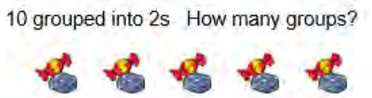
# EYFS – Division

## Concrete

- Sharing 1 to 1 eg. giving out cups - 5 cups for 5 people, 10 pieces of fruit to 10 children
- Matching 1 to 1 eg. Place settings at a Teddy Bears' Picnic – plates, place mates, knives, forks
- Sharing out concrete objects


- Grouping objects equally



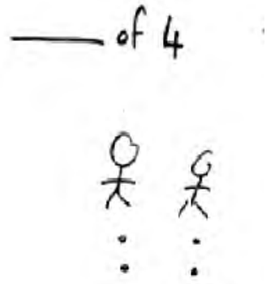


- Introduce halving practically

- Cutting lengths in half eg. String, strips of paper, playdough snakes, cubes

## Pictorial

- Mark-making
- Pre-cut pictures for children to share and group




**Oracy Sentence Stems:**

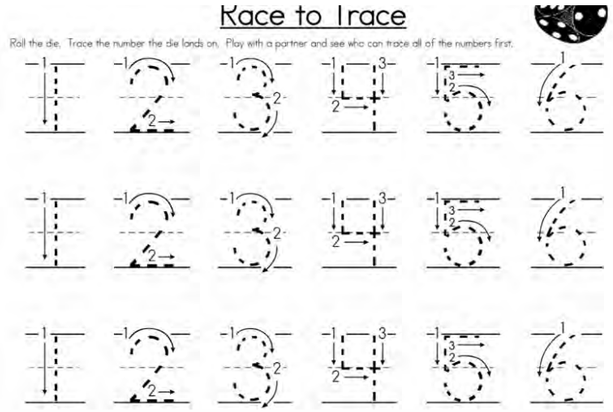
If we share equally, each person gets _____.

If there are 5 cups and 5 children, each child gets one cup.

The teddies have 1 plate each.

## Abstract

- Mark-making




## Guidance

Division should be introduced through the concept of sharing 1 to 1, progressing to sharing amounts equally and then grouping objects.

Make use of sharing and groups in illustrations
eg. Beans in Jack and the Bean Stalk, Food in Teddy Bear's Picnic

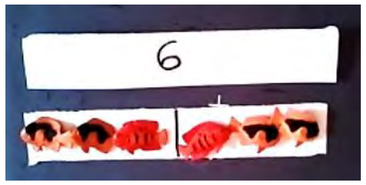
# Year 1 – Division

## Concrete

- Sharing/Halving even numbers between 2 up to 10 and 20 using concrete objects

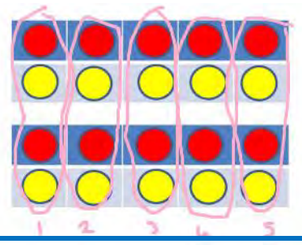
- Sharing equally using concrete objects eg. There are 3 bowls and 9 bananas, how many bananas are there in each bowl?

- Sharing concrete objects using concrete bar models



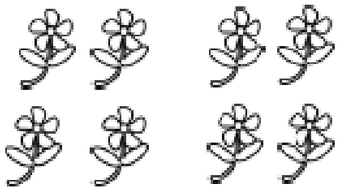

- Moving to grouping eg. How many groups of 2 in 6? Eg. How many groups of 5s in 10?

- Use of 10 frames to group eg. How many groups of 4 in 20?

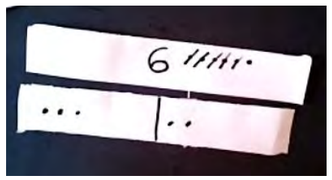


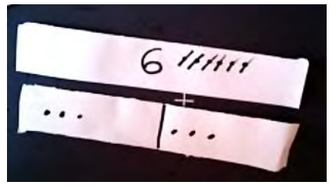
## Pictorial

- Use of pictures or shapes to share quantities

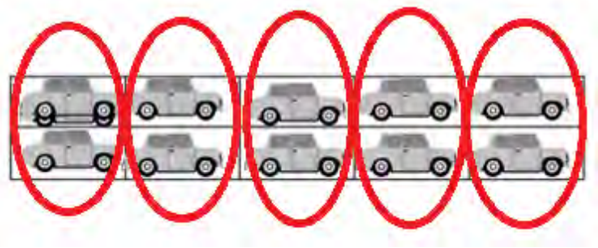


- Use of bar models to share equally



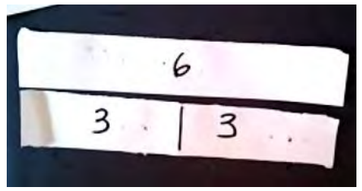




- Use of 10 frames and pictures in 10 frames to group



## Abstract

- Understanding ÷2 as half
- Understanding division as the inverse of multiplication
- Divide 10 in 5 groups. How many in each group?
- Abstract bar models




## Guidance

As with EYSS, division should be taught first through the concept of **sharing** amounts equally and then progressing to **grouping** objects.

Make use of sharing and groups in illustrations
eg. Beans in Jack and the Bean Stalk, Food in Teddy Bear's Picnic

See NC objectives for fractions.

**Oracy Sentence Stems:**

____ shared into ____ equal parts ____ is ____.

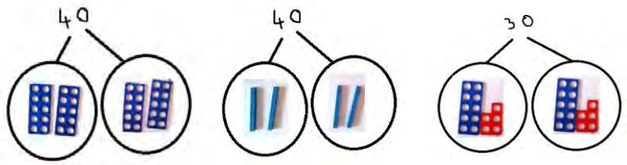
____ shared equally into groups of ____ makes ____ groups.
I shared ____ into ____ equal groups. There are ____ in each group.
The pattern is increasing in ____
The pattern is decreasing in ____
There are ____ groups of ten. There are ____ ones.
There will be ____ in each group.

# Year 2 – Division

## Concrete

- Share out quantities into equal groups using cubes, counters and other objects.


- Use of Numicon and Base 10 for halving numbers (sharing)

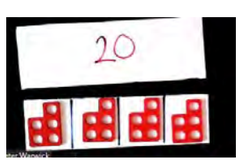


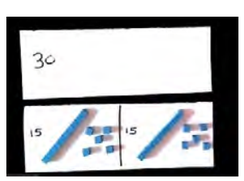

- Use of Numicon for grouping. How many groups of 5 in 20?

- Use of contextual questions: 20 children going on a school trip. Each car holds 5 people; how many cars are needed?

- Use of arrays. Eg. There are 20 cabbages and they are put into rows of 5. How many rows are there?

- Concrete Bar Models to represent division

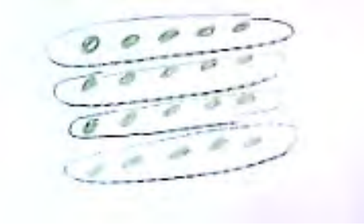


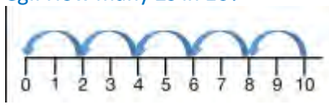

- Use of Cuisenaire number tracks eg. 15 ÷ 5

## Pictorial

- Grouping

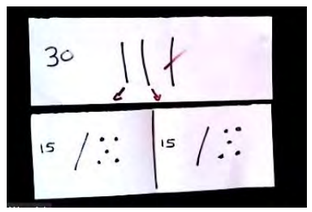


- Use number tracks/lines for questions eg.. How many 2s in 10?

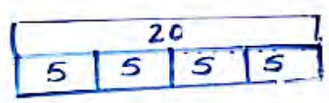



"How many 5s are there in 20?"


- Pictorial representations of bar models




- Bar models (continuous)




## Abstract

- Understand '÷ 2' as 'half of'.
- Understand that '÷ 4' as 'quarter of'.

- Understand that division is not commutative.
- Recognise relationship between x and ÷
- Record using division (÷) and equals (=) signs.

- Divide 10 into 5 groups. How many are in
- each group?

**Oracy Sentence Stems:**

____ shared into ____ equal parts ____ is ____.

____ divided by ____ is equal to ____.

We exchange 1 ten for 10 ones.

When we divide, the whole is known and the number or parts or the value of the parts is unknown

____ divided by ____ is equal to ____.

## Guidance

Division should be taught first through the concept of **sharing** amounts equally and then progressing to **grouping** objects.

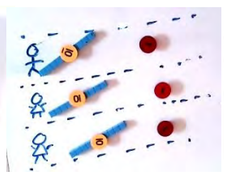
# Year 3 – Division

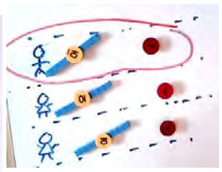
## Concrete

- Link division to multiplication through use of arrays and Cuisenaire tracks and the number sentences that can be created from them.
  eg. 15 x 3 = 15  5 x 3 = 15  15 ÷ 3 = 5  15 ÷ 5 = 3

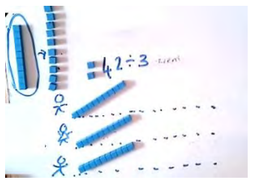
- Sharing using Base 10 and moving to place value counters

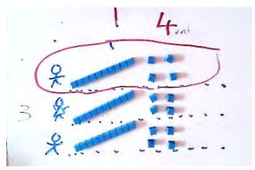
No exchange eg. 33 ÷ 3 = 11



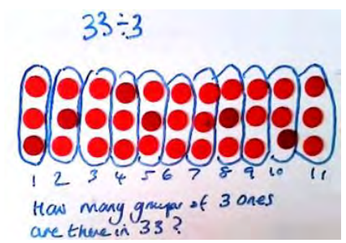


Exchange 10 eg. 42 ÷ 3 = 14

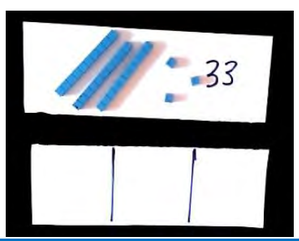


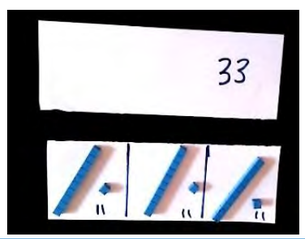



- Moving to grouping



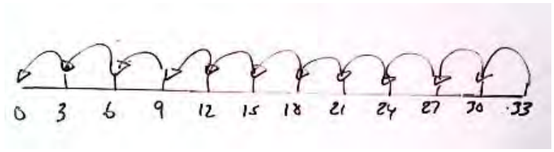

- Concrete bar modelling (continuous)



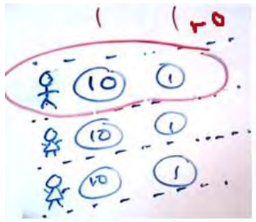




## Pictorial

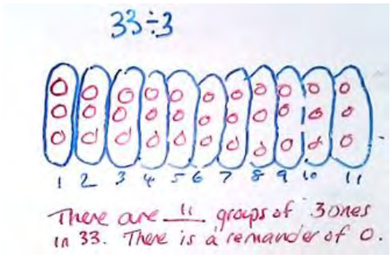
- Counting back on number lines



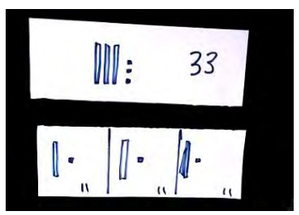

- Representing sharing pictorially

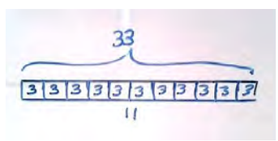



- Representing grouping pictorially




- Drawn bar models

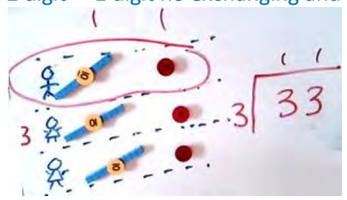


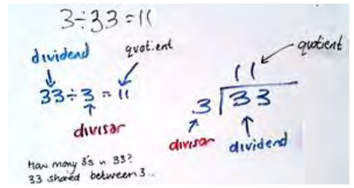




## Abstract

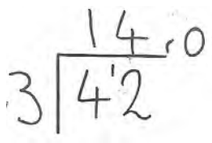
- Formal short division

2 digit ÷ 1 digit no exchanging and a remainder of 0




2 digit ÷ 1 digit with exchange and a remainder of 0




**Oracy Sentence Stems:**

____ divided by ____ is equal to ____.

When we divide, the whole is known and the number or parts or the value of the parts is also known.

____ x ____ is the same as ____ groups of ____

When we divide ___ by _____ there is a remainder of 0 which means it can divide equally.

## Guidance

Division should be taught first through the concept of sharing amounts equally and then progressing to grouping.

The concept of a remainder of 0 should be taught to allow for conceptual progression to remainders greater than 0 in Year 4.

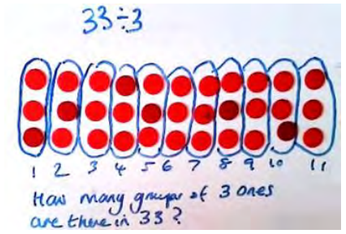
To divide successfully in their head, children need to be able to:
- Understand and use the vocabulary of division – for example in 18 ÷ 3 = 6, the 18 is the dividend, the 3 is the divisor and the 6 is the quotient (answers)
- Partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways,
- Recall multiplication of one-digit numbers and divide multiples of 10 or 100 by a single digit number using their knowledge of division facts and place value
- Know how to find a remainder working mentally, for example, find the remainder when 48 is divided by 5
- Understand and use multiplication and division as inverse operations.

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for division

# Year 4 – Division

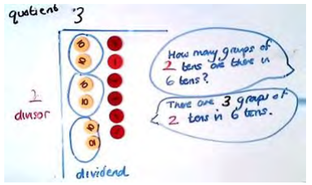
## Concrete

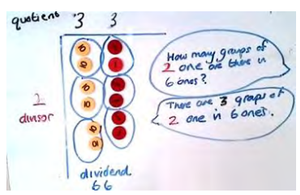
- As per year 3, grouping counters



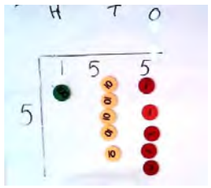

- Moving to grouping place value counters in a formal method layout:

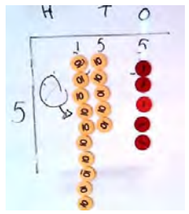
No exchange with a remainder of 0

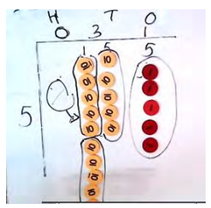


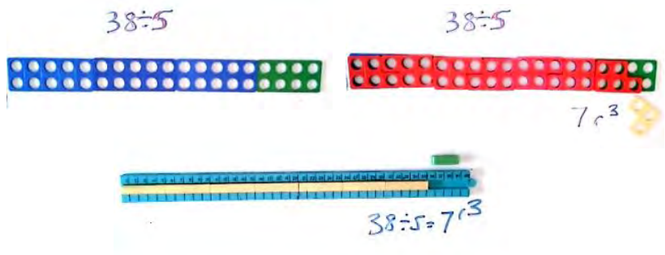

3 digit with exchange with a remainder of 0



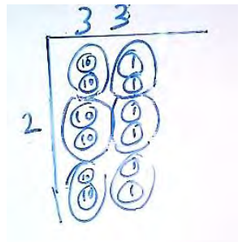




- Introduction of remainder greater than 0 using Numicon and Cuisenaire tracks

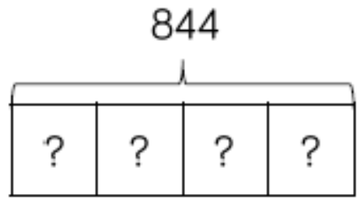



## Pictorial

- Pictorial representation of grouping




- Bar modelling (continuous)




**Oracy Sentence Stems:**

For every group of one twelve, there are two groups of six.

____ is divided into groups of ____.There are ____ groups and a remainder of ____.

The remainder is always less than the divisor.

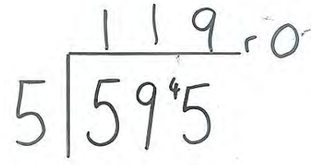
When we divide, the whole is known and the number or parts or the value of the parts is also known.

How many groups of 500 are there in 100? There are 0 groups of 5 hundreds in 1 hundred . I will exchange 100 for 10 tens. How many groups of 5 tens are there in 15 tens? There are 3 groups of 5 tens in 15 tens.

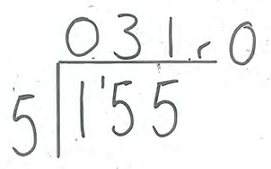
## Abstract

- Formal short division

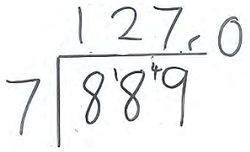
3 digit ÷ 1 digit (exchanging tens to ones and a remainder of 0)



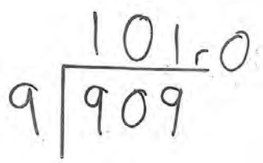

3 digit ÷ 1 digit (exchanging hundreds to tens and a remainder of 0)



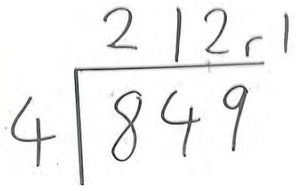

3 digit ÷ 1 digit (exchanging twice and a remainder of 0)




Use of 0s




Remainders greater than 0




## Guidance

Comfortable numbers should be used for questions to enable children to practise the method with ease.

The concept of a remainder of 0 should be taught to allow for conceptual progression to remainders greater than 0.

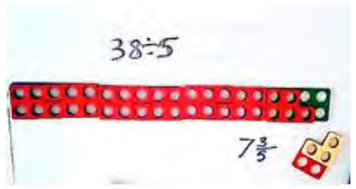
To calculate written methods of division successful, children also need to be able to:

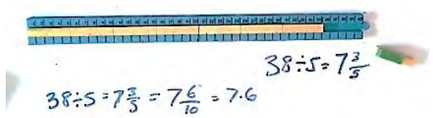
- Estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- Multiply a two-digit number by a single-digit number mentally;
- Subtract numbers using the column method.

# Year 5 – Division

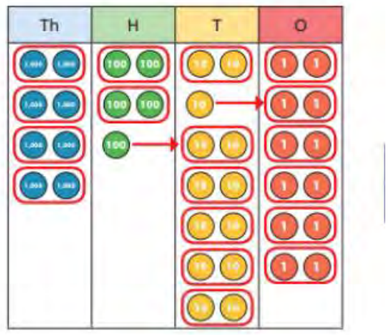
## Concrete

- Continued use of Numicon and Cuisenaire tracks to illustrate remainders bigger than 0 as whole numbers and fractions



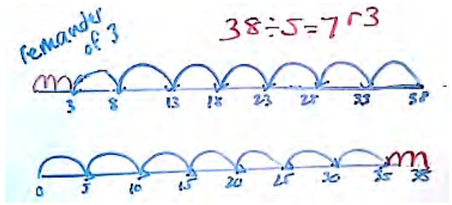




- Place Value Counters for 4 digit ÷ 1 digit
  eg. 8532 ÷ 2 (focus on language of grouping and exchange)

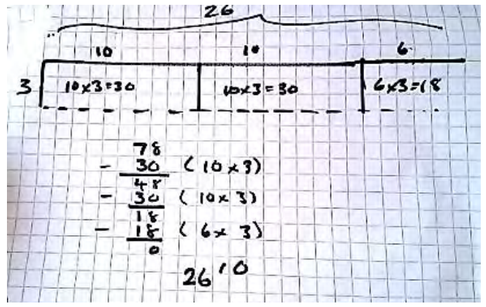



## Pictorial

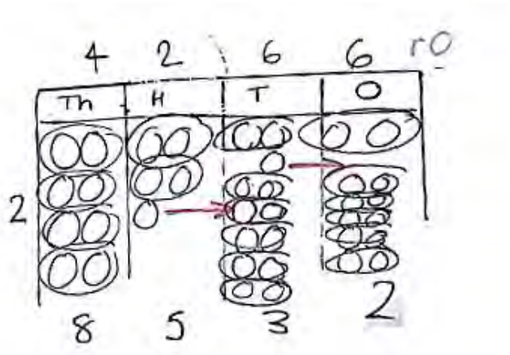
- Number lines




- Use of Area Method of Division




- Represent Place Value Counters (focus on language of grouping and exchange)




- Bar modelling for multiples

$7{,}335 \div 15 = 489$

| | 0 | 4 | 8 | 9 |
|---|---|---|---|---|
| 15 | 7 | $7_3$ | $13_3$ | $13_5$ |

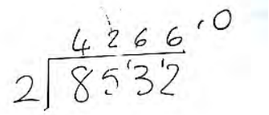
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 |

## Abstract

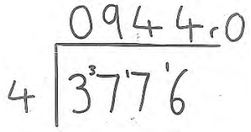
- Formal Short Division

Consolidation of Year 4 and then moving to:

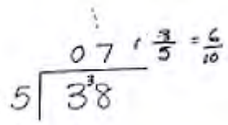
4 digit ÷ 1 (exchanging twice and a remainder of 0)




4 digit ÷ 1 (exchanging three times and a remainder of 0)




Remainders greater than 0 shown as whole numbers and fractions




**Oracy Sentence Stems:**

____ is divided into groups of ____.There are ____ groups and a remainder of ____.

The remainder is always less than the divisor.

How many groups of 2 thousand are there in 8 thousand? There are 4 groups of 2 thousand in 8 thousand. How many groups of 2 hundred are there in 5 hundred? There are 2 groups of 2 hundred in 5 hundred. I will exchange the remaining 1 hundred for 10 tens. I now have 13 tens. How many groups of 2 tens are there in 13 tens? There are 6 groups of 2 tens in 13 tens. I will exchange the remaining ten for 10 ones. I know have 12 ones. How many groups of 2 ones are there in 12 ones? There are 6 groups of 2 tens in 12 tens. There is a reminder of 0.

## Guidance

Comfortable numbers should be used for questions to enable children to practise the method with ease.

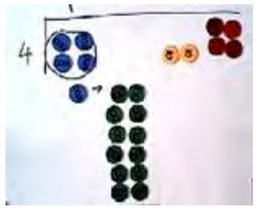
The concept of a remainder of 0 should be taught to allow for conceptual progression to remainders greater than 0.

To calculate written methods of division successful, children also need to be able to:
- Estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- Multiply a two-digit number by a single-digit number mentally;
- Subtract numbers using the column method

# Year 6 – Division

## Concrete

- Place Value counters used to consolidate the language of grouping and exchange for short and long division



**Oracy Sentence Stems:**

____ is divided into groups of ____. There are ____ groups and a remainder of ____.

The remainder is always less than the divisor.

How many groups of 4 thousand are there in 8 thousand? There are 2 groups of 2 thousand in 8 thousand. I have no thousands remaining.

How many groups of 4 hundred are there in 4 hundred? There is 1 group of 4 hundred in 4 hundred. I have no hundreds remaining.

How many groups of 4 tens are there in 4 tens? There is 1 group of 4 tens in 4 tens. I have no tens remaining.

How many groups of 4 ones are there in 8 ones? There are 2 groups of 4 ones in 8 tens. I have no ones remaining.

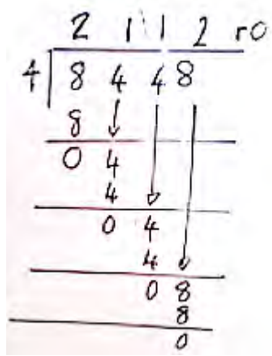
## Pictorial

- As above

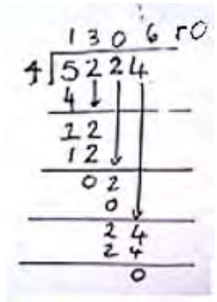
## Abstract

- Consolidation of Short Division (See Year 4 and 5)
- Formal Long Division

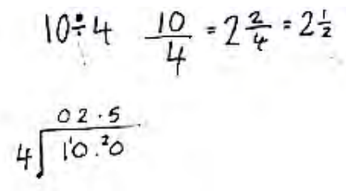
4 digit ÷1 digit (remainder of 0)



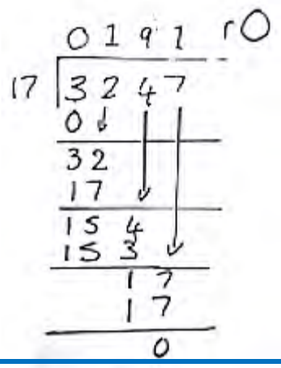
4 digit ÷1 digit (Use of 0s)

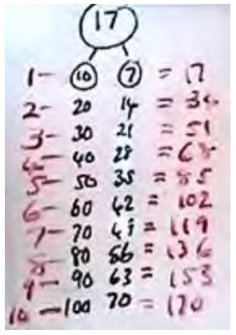


Remainders as fractions and decimals



4 digit ÷ 2 digit (Divisors greater than 12)





## Guidance

Comfortable numbers should be used for questions to enable children to practise the method with ease.

The concept of a remainder of 0 should be taught to allow for conceptual progression to remainders greater than 0.

To calculate written methods of division successful, children also need to be able to:

- Estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- Multiply a two-digit number by a single-digit number mentally;
- Subtract numbers using the column method