Mathematics Policy

Approved: September 2021
Review date: September 2022

Intent

At The Baird, we have high expectations for all of our pupils and believe that all pupils can achieve highly and become confident and skilled mathematicians. We do not believe that there are individuals who can do mathematics and those who just cannot do mathematics. For this reason, we adopt particular strategies to support all pupils to achieve highly. All teachers adopt a growth mindset and challenge the view that some pupils cannot succeed in mathematics. We strive for all pupils to be curious about mathematics and to understand the importance of mathematics in their everyday lives.

Since the introduction of the new Mathematics Curriculum in 2014, we have adopted a Mastery Approach to Maths.

Mastery is the ultimate aim of all learning in mathematics. A mathematical concept or skill has been mastered when, through exploration, clarification, practice and application over time, a person can represent it in multiple ways, has the mathematical language to be able to communicate related ideas, and can think mathematically with the concept so that they can independently apply it to a totally new problem in an unfamiliar situation.

In line with the aims of the National Curriculum for mathematics, at The Baird, we aim to ensure that our pupils gain:

- Deep and sustainable learning in mathematics which they are able to apply to a range of contexts
- An ability to build on prior knowledge
- An ability to reason about a concept and make connections
- Sound procedural and conceptual understanding
- Fluency with number and the ability to apply this to a range of contexts
- An ability to solve complex problems by breaking them down into smaller steps and showing resilience

Implementation

At The Baird, we follow a mastery approach to the curriculum, using the White Rose Maths Hub curriculum. Typically, you will see the following features to mathematics learning:

- The large majority of pupils will progress through the curriculum content at the same pace. Differentiation is achieved by emphasising deep knowledge and through individual support and intervention. The questioning and scaffolding individual pupils receive in class as they work through problems will differ and pupils who grasp concepts rapidly are challenged through more demanding problems which deepen their knowledge further.

- Practise and consolidation play a central role to mathematics learning. Carefully designed variation within this builds fluency and understanding of underlying mathematical concepts in tandem.

- Teachers use precise questioning in class to challenge pupil's conceptual and procedural knowledge as well as their problem solving and reasoning skills. This ensures early identification of pupils who may not make the expected progress without additional intervention.

- Teachers use the CPA approach (concrete, pictorial, abstract) to ensure that concepts are modelled to pupils using multiple representations. This ensures that procedural and conceptual understanding are developed simultaneously.

- Pupils are taught in mixed ability groups as we believe that all pupils can attain highly in mathematics and every pupil will have different strengths and development areas. Therefore, groupings within classes are flexible, based on good assessment for learning, and pupils will work in different groups dependent on their need.

Curriculum – EYFS

Mathematics within the EYFS is developed through purposeful, play-based experiences and will be represented throughout the indoor and outdoor provision. In Reception, the learning will follow the Mastering Number programme for Number and the White Rose Maths Hub curriculum for Shape, Space and Measures in order to meet the requirements of the Early Years Framework.

As the pupils progress through, more focus is placed on representing their mathematical knowledge through more formal experiences. Pupils will be encouraged to record their mathematical thinking when ready and this will increase throughout the year.

Curriculum – Year 1 to 6

We follow the White Rose Maths Hub curriculum, which is spiral in approach with pupils revisiting previously learnt topics. Pupils spend far longer on key mathematical concepts in number. From Year 1 to Year 6, we follow a structured curriculum map however, this is flexible to the needs of the pupils and therefore if most pupils have not grasped a concept thoroughly, there is flexibility to adapt the curriculum map and revisit concepts.

Those pupils who grasp concepts more rapidly are given opportunities to deepen their knowledge further and improve their reasoning skills, through rich problems, rather than accelerating on to new curriculum content. Pupils are challenged through sophisticated problem-solving tasks that encourage them to apply the concept to gain depth of understanding.

Lesson Design

Teachers follow a simple lesson structure (see Appendix 1). They will briefly recap prior learning before then building on this prior learning by introducing the next step to the pupils. Teachers use concrete apparatus and visual representations at every opportunity to reinforce the concept and ensure deep and meaningful understanding. Pupils have the opportunity to practise the new skills using carefully crafted and varied questioning and talk will be used regularly to allow the pupils the opportunity to demonstrate their reasoning skills.

Thorough Assessment for Learning will be used to target pupils who have not grasped the concept.

During independent learning the pupils should, as far as possible, practise the skills that they have acquired independently to avoid an over-reliance on adults, however throughout this time, additional staff should work with different pupils to support and assess learning.

Differentiation

Differentiation will be seen by pupils working on differing complexities of problems within the same objective, called 'Intelligent Practice'. 'Rapid graspers' will have challenging problems, involving reasoning, to solve to ensure that they continue to make progress and to deepen their understanding of the concept. There will be some pupils who are using practical equipment for longer in order to support learning. While our aim is that the gap between mathematical attainment in our classes is closed, we accept that in some Key Stage 2 classes there is already a large gap in the attainment of groups of pupils. There will therefore be a need to give some pupils in these year groups separate mathematical activities.

Interventions
Using formative assessment gathered through the practise tasks, teacher questioning and other formative assessment methods, any pupils who have not grasped the concept or who have misconceptions should have a rapid intervention to ensure that they are ready for the next step of learning. Where possible, this will occur on the same day (or already as part of the maths lesson) to ensure that gaps are rapidly plugged, ready for the next steps.

Resources
Within all lessons, teachers utilise practical resources to ensure that concepts are represented to the pupils, in multiple ways, to gain depth of understanding. Resources should also include relevant vocabulary (with Communication in Print) on display on Maths working walls to support children's talk about the concepts.

Recording
We place an emphasis on presentation. Pupil's number formation should be focused on and misconceptions addressed in marking. Whilst presentation is always important, we recognise the value of pictorial representations and pupil's workings in maths.

The contribution of mathematics to other curriculum areas
Generally, mathematics will be taught discretely to ensure that links are not tenuous, however where there is a clear link to another subject e.g. data handling within science, mathematics skills should be applied to this subject and used to evidence the pupils' depth of understanding.

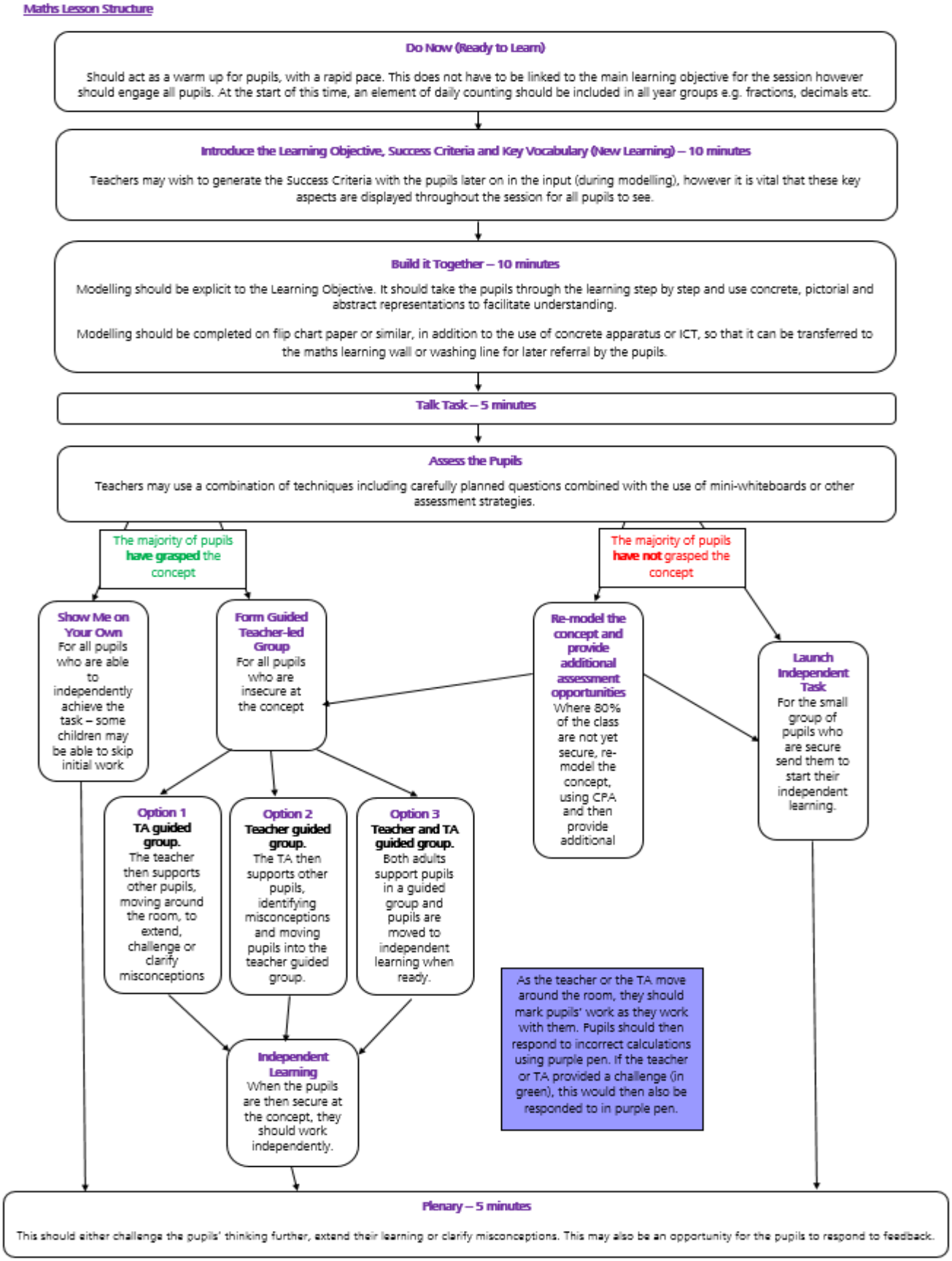
Impact
Assessment and Reporting
Teachers will use targeted questions and problems that require pupils to remember, understand, apply, analyse and evaluate their knowledge and skills. These assessments are used to inform the Target Tracker statements to assess the pupils on an ongoing basis and a judgement about whether a pupil is on track to achieve age-related expectations will be made at the end of the term by making a 'step' judgement. This information will all be recorded in Target Tracker and discussed at termly Pupil Progress Meetings.

We also use termly formal written assessments to support our teachers in comparing their pupils to national averages.

Policy Status and Review

Written by:	Maths Subject Leader – Fiona Parmee
Owner:	Maths Subject Leader
Approval date:	September 2021
Review date:	September 2022

Appendix 1 – Model Maths Lesson Structure



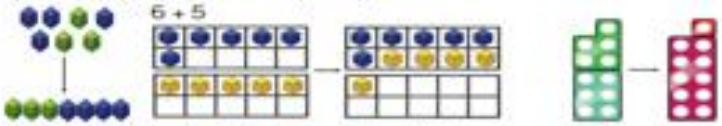
Appendix 2 – Written calculation progression document

THE BAIRD PRIMARY ACADEMY

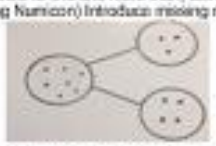
Progression in Written Calculations: ADDITION

BAND 1

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. Children use pictures, stories, songs, use objects, and materials to help develop this.



They use their counting skills to find one more than, using resources to help count. They use models and images to support learning number bonds to 10, moving on to 20 (including Numicon) Introduce missing number problems e.g. 7 = _ - 9 and calculations where = is at the start.



$6 + \square = 11$

$6 + 5 = 5 + \square$

$6 + 5 = \square + 4$

They physically jump along a number line. Written number sentences are introduced with the appropriate mathematical symbols. Calculations must be orally rehearsed. Teachers start to introduce the use of the number line to support with adding 1-digit and 2-digit number to 20.

BAND 2

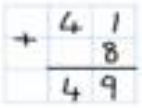
Developing a range of mental methods

Use concrete objects, including base 10, and pictorial representations to add. Methods include counting on, partitioning to get to next ten, then bridge past it as well as partitioning T and O.

Use and apply number bonds and place value knowledge to recall facts e.g. 2 + 3 = 5 so 20 + 30 = 50.
Children to add in multiples of tens and ones on number squares, preparing to calculate mentally using partitioning and place value.

41 + 8

1 + 8 = 9
40 + 9 = 49

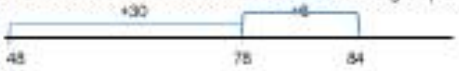


What is 2 more than 4?
What is the sum of 2 and 4?
What is the total of 4 and 2?
4 + 2

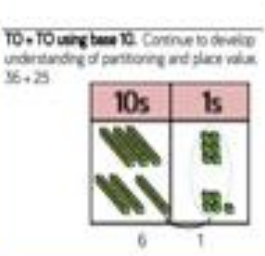
Use of blank number lines

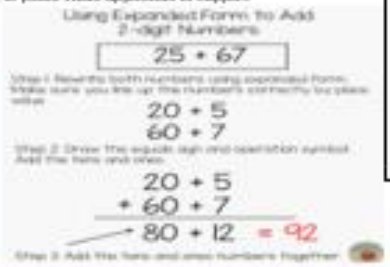
BAND 3

Continue to develop efficiency with a number line then introduce column method with expanded addition: Children to cement understanding of partitioning through adding multiples of ten. 48 + 36 =



Children to add numbers with **up to** 3 digits using expanded methods with use of place value apparatus to support.





Children to estimate answer to calculation and use inverse operation to check.

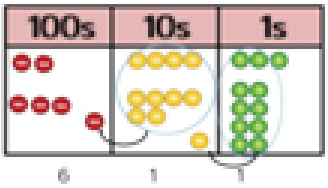
BAND 4

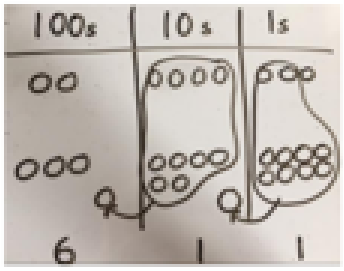
Compact Column Method

Children to add numbers with **up to** 4 digits using formal methods. To begin with, they still need to be using concrete apparatus and pictorial representations to understand what is happening in the calculation. They also need to see expanded and compact method side by side to understand the progression.

They need to remember to start with the ones, then the tens, then the hundreds, etc.

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.





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

It is important at this stage that the children still include the column headings to reinforce place value.

BAND 6

Compact Column Method

Children to add whole numbers with more than 4 digits (extending to more than two numbers) using formal methods.

TTh	Th	H	T	U
6	4	2	5	3
+	4	4	7	9
6	8	7	3	2
		1	1	

"Carry the hundred"

Children to estimate using rounding to check the approximate value of the answer

Th	H	T	U	.	t	h
£2	4	4	2	.	4	9
+	£7	3	.	4	2	
£2	5	1	5	.	9	1
	1				1	

"Carry the hundredths"

Extend to decimals in the context of money and measure.

The children still need to include the column headings to reinforce place value.

BAND 8

Compact Column Method

Extend addition to more than two numbers and decimal numbers including complex decimal quantities

Th	H	T	U	.	t	h
£4	6	8	1	.	9	0
	£2	6	.	8	5	
+		£0	.	7	2	
£4	7	0	9	.	4	7
	1	2				

U	.	t	h	t	h
1	.	0	5	0	
0	.	8	0	0	
+ 0	.	4	0	5	
2	.	2	5	5	
1					

1.05 + 0.8 + 0.405
Encourage children to use zero as a place holder to improve their accuracy.

Children to solve multi-step word problems involving numbers of this difficulty.

The children still need to include the column headings to reinforce place value.

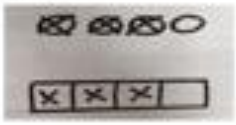
Progression in Written Calculations: SUBTRACTION

BAND 1

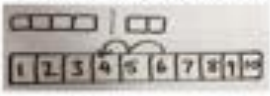
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation.
Children use pictures, stories and songs and use objects and materials to help oral rehearsal is essential.
They count and gain using objects, physically moving them. They respond to questions like – I have 3 balloons, 2 burst. How many are left?

Physically taking away and removing objects from a whole
Ten frames, Numicon, cubes and other items such as Sweetbags could be used).

Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.



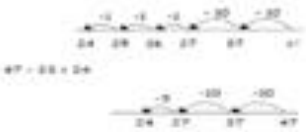
They use their counting skills to find one less than, using resources to help count (up to 100).
Written number sentences are introduced with the appropriate mathematical symbols.
Teachers start to introduce the use of the number line. They physically jump along a number line.



Develop use of the number line by counting back initially with numbers below 20 e.g. 17 - 5. Then move onto larger numbers. Use your discretion to decide when it is time to move from a marked to an empty number line.

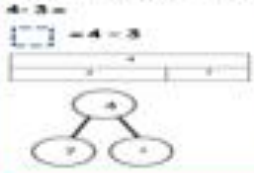
BAND 2

Developing the use of blank number line Use concrete objects, including base 10, and pictorial representations to subtract by counting back, partitioning to count back to the ten then bridging. Then help children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

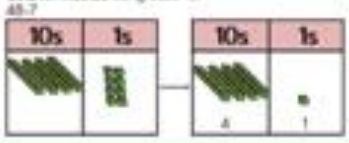


Note: It is vital that children can count back in tens from any number.

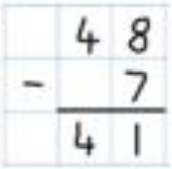
Children to subtract in multiples of tens and ones, preparing to calculate mentally using partitioning and place value. Use and apply number bonds and place value knowledge to recall facts e.g. 5 – 2 = 3 so 50 – 20 = 30.
Children to recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing numbers problems. i.e. 100 - 44 = ___ 44 + __ = 100



Column method using base 10.



Children to represent the base 10 pictorially.



BAND 3

Continue to develop efficiency with a number line then expanded column method with expanded subtraction, using Dienes to support when exchanging is required:
The children introduced to complementary addition (also known as counting on) for subtraction. The use of models, such as Dienes or Cuisenaire, is extremely important here to understand the idea of "difference."

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used).

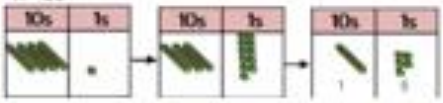
Calculate the difference between 8 and 5.

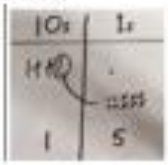
Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.

Children to continue to estimate answer to calculation and use inverse to check.

Expanded Written Method
Children to subtract numbers with **up to** 3 digits using formal methods and Dienes to support the understanding of exchange.
Building understanding of place value and ability to partition numbers

Column method using base 10 and having to exchange.
41 - 26





No exchanging required

89 = 80 9
- 57 - 50 7
30 + 2 = 32

Exchanging needed

BAND 4

Developing the expanded written method to use with up to 4-digit numbers

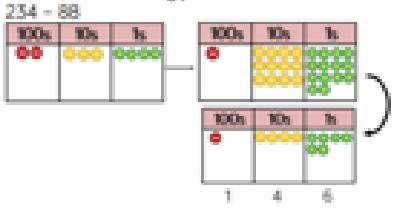
Children to subtract numbers with **up to** 4 digits using formal methods.

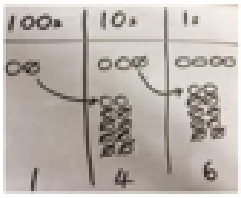
Children to continue to gain confidence in expanded method including mixed numbers i.e. 4523 - 312 =

600 140
~~6~~00 + ~~4~~0 + 14
- 200 + 80 + 6
400 + 60 + 8 = 468

Develop understanding of place value through exchanging with the use of physical resources if necessary; such as dienes or place value counters. Keep showing the column subtraction method alongside the concrete and pictorial representations when moving towards compact method.

234 – 88





$$\begin{array}{r} {}^{2}\cancel{3}^{1}4 \\ -\ 88 \\ \hline 6 \end{array}$$

BAND 5

Compact Method

Children to subtract whole numbers with more than 4 digits using formal methods. They may still use base ten apparatus to support and reason.

3754 – 286

$$\begin{array}{r} {}^{6}1{}^{1}4 \\ 3\cancel{7}\cancel{5}4 \\ -\ 286 \\ \hline 3468 \end{array}$$

Extend to decimals in the context of money and measure and solve multi-step problems. The children still need to include the column headings to reinforce place value.

$$\begin{array}{r} {}^{6}\cancel{€}3\,8\,{}^{1}\cancel{7}{}^{1}4\,{}^{1}\cancel{£}\,.\,{}^{13}\cancel{4}{}^{1}5 \\ -\ €7\,3\,7\,1\,.\,4\,9 \\ \hline €3\,1\,3\,7\,1\,.\,9\,6 \end{array}$$

Children to use rounding to check answers to calculations and determine, in the context of the problem, levels of accuracy

BAND 6

Compact Method

Children to develop subtraction with mixed decimal up to 3dp E.g. 4381.72 - 427.496

The children still need to include the column headings to reinforce place value.

Children to solve multi-step word problems involving numbers of this difficulty.

$$\begin{array}{r} {}^{3}\cancel{4}{}^{1}3\,{}^{7}\cancel{8}{}^{1}1\,.\,{}^{6}\cancel{7}\,{}^{1}\cancel{2}{}^{1}0 \\ -\ 4\,2\,7\,.\,4\,9\,6 \\ \hline £3\,9\,5\,4\,.\,2\,2\,4 \end{array}$$

Children to use zero as a place holder

Children to use the same method when zeros are within the number and need to exchange through it.

$$\begin{array}{r} 2\,{}^{8}\cancel{0}\,{}^{9}\cancel{0}\,{}^{1}3\,.\,4\,2 \\ -\ 2\,2\,4\,.\,2\,1 \\ \hline 2\,6\,7\,9\,.\,2\,1 \end{array}$$

Progression in Calculations: MULTIPLICATION

BAND 1

Multiplication concepts introduced through addition and addition strategies.
Use of concrete apparatus for the children to physically count and see.
Number rhymes are used and rehearsed.
Mostly pictorial representations: How many groups of 2 are there?


Laying the foundations for multiplying by maximising opportunities when counting in 2's, 5's and 10's
Understand multiplication as repeated addition - supported by apparatus e.g. multilink.

Laying the foundations for multiplying by maximising opportunities when counting in 2's, 5's and 10's
Understand multiplication as repeated addition - supported by apparatus.
3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group.

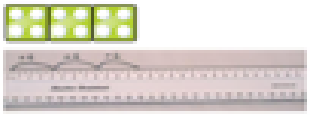
BAND 2

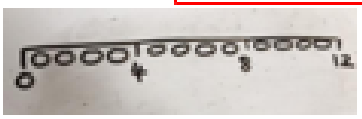
Understand multiplication as groups:

Recall and use x and ÷ facts for 2x, 5x and 10x tables.

Number lines to show repeated groups -
5 × 4




Cuisenaire rods can be used too.



Understand commutative law:
Use arrays to illustrate commutativity counters and other objects can also be used.
2 × 5 = 5 × 2

7 x 5 = 35

5 x 7 = 35

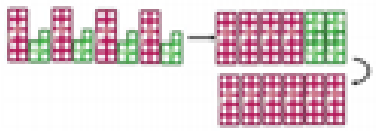
Understand multiplication as arrays

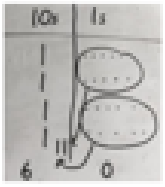
BAND 3

Progression on to more formal methods
Use partitioning to support mental methods Children to multiply 2 digit by 1 digit numbers **Introduce area model (grid method)**
Children to represent the concrete manipulatives pictorially.

Recall and use x and ÷ facts for 2x, 4x and 8x tables.

Partition to multiply using Numicon, base 10 or Cuisenaire rods.
4 × 15





Once secure this step can be left off.

24 x 3 =
20 4
x 3
60 12

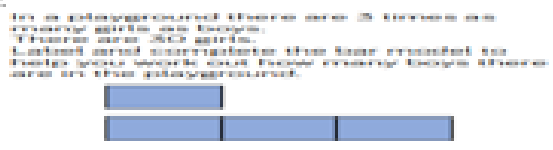
Work with times table facts children can do mentally in order to experience success.

12
+60
72

4 x 3 = 12
20 x 3 = 60
60 + 12 = 72

Final step to support future method

Children should be able to answer questions that use the vocabulary "times as many". Bar models are particularly useful here to help children visualise the concept.

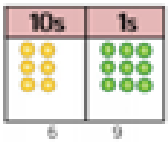


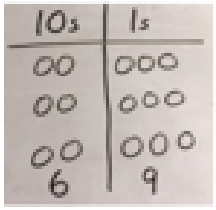
BAND 4

Recall x and ÷ facts upto 12 x 12

Progressing to formal written methods

Formal column method with place value counters (base 10 can also be used.) 3 x 23





3×23 → $3 \times 20 = 60$, $3 \times 3 = 9$, $60 + 9 = 69$

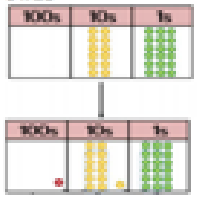
Expanded column method leading to compact method: Children to multiply 2 digit and 3 digit by 1 digit numbers, still showing area model alongside written methods.

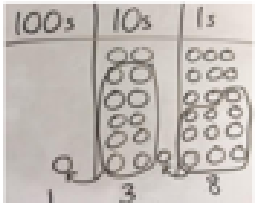
```
  436
x   5
   30   (5 x 6)
 + 150  (5 x 30)
 + 2000 (5 x 400)
  2180
```

First, multiply U by 5 Next, multiply T by 5 Then, multiply H by 5 Finally, add answers together

Leave one square gap

6 x 23





BAND 5

Develop greater understanding of expanded column method progression on to compact method.
Children to multiply up to 4 digits by a 1 or 2 digit numbers – both methods shown alongside each other.
Expanded method

```
  376
x  43
  18   (3 x 6)
 210   (3 x 70)
 900   (3 x 300)
 240   (40 x 6)
2800   (40 x 70)
12000  (40 x 300)
16168
 2
```

```
   1 2 4
x    2 6
-------
   7 4 4
 1   2
2 4 8 0
-------
3 2 2 4
1 1
```

Answer: 3224

Children should be encouraged to estimate and check the reasonableness of their answers.

BAND 6

Compact Long Multiplication Method
Children to multiply a 4 digit by 2 digit numbers

```
  5628
x   46
------
 3376
 3 1 4
+225120
 1 1 1
------
258888
```

First, multiply 5628 by 6, digit at a time.

Carry over digits to be added to the next multiplied answer (ensure these are written smaller).

Next, multiply 5628 by 40, digit at a time.

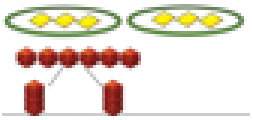
Finally, add up answers.

Extend to decimals (TU.t x U and TU.t x U.t)

Progression in Written Calculations: DIVISION

BAND 1

Practical experience of sharing.
'One for me, one for you' is repeated subtraction of one. The children share out toys, fruit and other materials in context where possible.
There are 12 sweets and 2 children. They share the sweets equally, how many sweets does each child have?



Introduce Grouping
Give visual images and opportunities to physically sort objects and people into groups, e.g. There are 15 sweets and each party bag needs three sweets. How many party bags can be made?
Develop understanding of division and use jottings, including dots or tally marks, to support calculations

Sharing equally - 6 apples shared between 2 people, how many do they each get?

6 ÷ 2 = 3

3	3

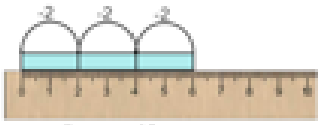
Children should also be encouraged to use their 2 times tables facts.

BAND 2

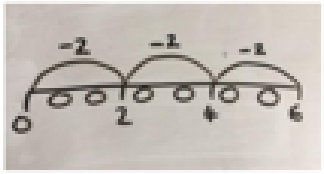
Recall and use x and ÷ facts for 2x, 5x and 10x tables.

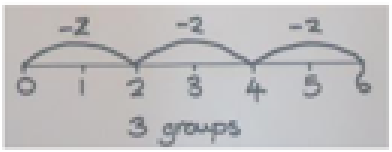
Beginning to use blank number lines.
Solve grouping and sharing problems by repeated subtraction on an empty number line.
E.g. A chew bar costs 2p. How many can I buy with 6p? 6 ÷ 2 =

Repeated subtraction using Cuisenaire rods above a ruler.
6 ÷ 2

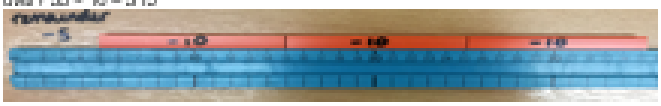


3 groups of 2





Begin to extend to calculations with remainders
Introduce the concept of a **remainder** through real situations, e.g. A chocolate bar costs 10p. How many can I buy with 35p? How much money will I have left over? 35 ÷ 10 = 3 r5



I can buy 3 chocolate bars and I will have 5p left.

BAND 3

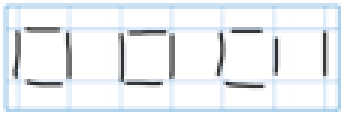
Recall and use x and ÷ facts for 3x, 4x and 8x tables.

Consolidate calculations with remainders, 13 ÷ 4 = 3 r1

'2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used.
13 ÷ 4

Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.

There are 3 whole squares, with 1 left over.



There are 3 whole squares, with 1 left over.

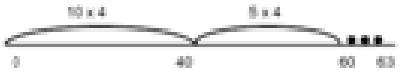
13 ÷ 4 = 3 remainder 1

Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

Children to be able to divide numbers with 2 digits by 1 digit using number line, then moving onto using base ten apparatus.

Consolidate calculations with remainders and developing to jump in 'chunks' of the divisor, 63 ÷ 4 = 15 r3



Children should make a note of 10x, 5x and 2x the divisor to help them choose an appropriate 'chunk'.

10 x 4 = 40
5 x 4 = 20
2 x 4 = 8

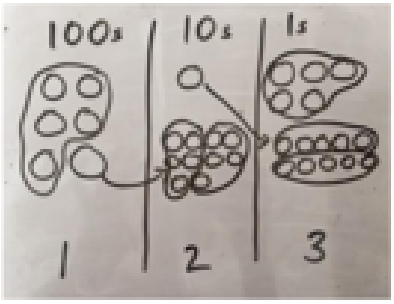
Sharing using place value counters.
42 ÷ 3 = 14

BAND 4

Recall x and ÷ facts upto 12 x 12

Children to be able to divide numbers with 3 digits by 1 digit

Short division using place value counters to group.
615 ÷ 5



1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Begin to introduce short division method (bus stop)

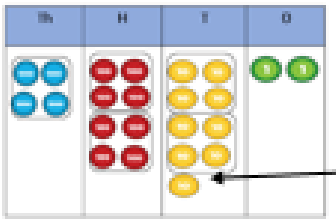
$$5\overline{)615} = 123$$

BAND 5

Short Written Method (Bus stop)

It is important that children have a clear conceptual understanding of division as they continue to use the 'bus-stop' method.

Children to be able to divide numbers up to 4 digits by 1 digit, still using place value counters to scaffold the method where necessary.



4892 ÷ 4 =

$$4\overline{)4892} = 1223$$

Exchange the remaining Ten for 10 ones to make 12 ÷ 4

$$4\overline{)4291} = 72 \text{ r } 3$$

Extend to decimals
(TU.t x U and TU.t x U.t)

$$4\overline{)4291.00} = 72.75$$

BAND 6

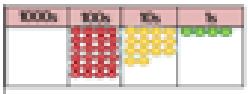
Compact Written Method - Long and Short division
Children to be able to divide numbers with 4 digits by 2 digit

Long division using place value counters
2544 ÷ 12

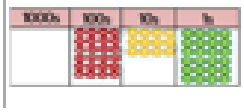
We can't group 2 thousands into groups of 12 so will exchange them.

We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$12\overline{)2544} = 212$$



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.



After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

Continue to use place value counters to scaffold the long division method.

Long Division (4 by 2)

Divide one number at a time by 23, starting with Th

$$23\overline{)2642} = 114 \text{ r } 20$$

$23 \times 4 = 92$

1 - Record the multiple of the divisor you are subtracting under the number you are dividing.
2 - Subtract that to leave you the remainder
3 - "Bring down" the number in the next column to the right (in this case, the 4). That gives you the next number to divide by the divisor.
4 – Repeat steps 1-3 for this number, then the next number until you cannot subtract multiples of the divisor any more.

Short Division (4 by 2)

Divide one number at a time by 23, starting with Th

$$23\overline{)2642} = 114 \text{ r } 20 \text{ or } 114\tfrac{20}{23}$$

THE BAIRD PRIMARY ACADEMY

Appendix 3 – Mental calculation progression document

Progression in Mental Calculations: ADDITION and SUBTRACTION

Counting Forwards and Backwards	Partitioning Numbers can be partitioned- both along the place value boundaries (canonically) and in other ways (non-canonically).	Compensating and Adjusting Compensation involves adding more than you need and then subtracting the extra off that you have added.	Near Doubles When children have an automatic recall of basic double facts, they can use this information when adding two numbers that are very close to each other.
Counting both forwards and backwards beginning at one, and counting on in ones.	Break up large numbers into smaller ones e.g. 6 = 5 + 1 How many ways can you split 6?		
Counting on and back is extended by beginning at different numbers and counting forwards and backwards in steps, not only of ones, but also of twos	Calculations with whole numbers which do not involve crossing place value boundaries- e.g. 23 + 45= ? by 40 + 5 +20 + 3 or 40 + 23 + 5		Near doubles to numbers under 20 e.g. 18 + 16 is double 18 and subtract 2 or double 16 and add 2.
Counting on or back in tens from any number– e.g. working out 27 + 60= ? by counting on in tens from 27	Calculations with whole numbers which involves crossing place value boundaries e.g. 49 – 32= ? by 49 – 9 – 23 or 57 + 34=? by 57 + 3 + 31	Compensating and adjusting to 10– e.g. 34 + 9=? by 34 + 10 – 1 or 34 – 11= ? by 34 – 100 – 1 = ?	Near doubles to multiples of 10 e.g. 60 + 70 is double 60 and add 10 or double 70 and subtract 10 or 75 + 76 is double 76 and subtract 1 or double 75 and add 1.
Counting on or back in fives from any multiple of 5– e.g. 35+15=? by counting on in steps of 5 from 35.	Calculations with decimal numbers which do not involve crossing place value boundaries 5.6 + 3.7= ? by 5.6 + 3 +0.7 or 540 + 380= ? by 540 + 300 + 80 or 540 + 360 + 20	Compensating and adjusting multiples of 10 e.g. 38 + 68= ? by 38 + 70 – 2 or 45 – 29 = 45 – 30 + 1	
Counting on or back in hundreds from any number e.g. 570 + 300= ? by counting on in hundreds from 570.	Calculations with decimal numbers which involve crossing place value boundaries e.g. 1.4 + 1.7= ? by 1.4 + 0.6 + 1.1 and 0.8 + 0.35= ? by 0.8 + 0.2 + 0.15	Compensating and adjusting multiples of 10 or 100 e.g. 138 + 69= ? by 138 + 70 – 1 or 299 – 48 = 300 – 48 – 1	Decimal near doubles to whole numbers e.g. 2.5 + 2.6 is double 2.5 add 0.1 or double 2.6 subtract 0.1.
Counting on or back in tenths and/or hundredths- e.g. 3.2 + 0.6 = ? by counting on in tenths. 1.7 + 0.55=? by counting on in tenths and hundredths.		Compensating and adjusting multiples with decimals e.g 2 ½ + 1 ¾ by 2½ + 2 – ¼ or 5.7 + 3.9 by 5.7 + 4.0 – 0.1	

Progression in Mental Calculations: MULTIPLICATION and DIVISION, and FDP

Multiplication and Division Place Value	Multiplication and Division Doubling and Halving	Fractions, Decimals and Percentages Children should be able to develop their understanding of fractions, decimals and percentages and how they are related to division. They should therefore be able to use their rapid recall multiplication and division facts to calculate some questions involving fractions, decimals and percentages mentally.
	Find the doubles and halves of any two-digit number (Y3)	
	Find the doubles and halves of any two-digit number and any multiple of 10 or 100– e.g. half 680 or double 73 (Y4/5)	
Multiply a 2-digit number by a single digit by partitioning– e.g. 26 x 3 = 20 x 3 + 6 x 3 (Y3/4)	Multiply and divide by 4 by doubling/halving twice and 8 by doubling/halving again. – e.g. 34 x 4 = 34 x 2 x 2. (Y4/5)	Mentally find fractions of numbers in the 2,3,4,5 and 10 times table using known multiplication and division facts– e.g. 3/5 of 45 by 45 ÷ 5 x 3. (Y3/4)
	Find the doubles and halves of any number up to 10,000 by partitioning – e.g. half of 32,202 by halving 3,000, 2000, 200 and 2. (Y5/6)	Recall percentage equivalents to ½, 1/3, ⅕, ¼, 1/10 and 1/100 – e.g. ¼ = 25% (Y5)
Multiply a decimal number with up to 2 decimal places by a single digit by partitioning– e.g. 3.42 x 4 = 3 x 4 + 0.4 x 4 + 0.02 x 4 (Y5/6)	Multiply by 50 by multiplying by 100 and halving e.g. 8 x 50= 8 x 100 divided by 2 (Y5/6) Divide a multiple of 50 by 50 by dividing by 100 then doubling- e.g. 450 ÷ 50= 450 ÷ 10 x 2 (Y5/6)	Find 10% or multiples of 10% of whole numbers and quantities- e.g. 30% of 50 by 50 ÷ 10 x 3 (Y5)
	Divide a multiple of 25 by 25 dividing by 100 then multiplying by 4 (by doubling and doubling again) e.g. 350 ÷ 25 = 350 ÷ 100 x 2 x2 (Y5/6) Double and half decimal number with up to one decimal place by partitioning – e.g. half of 8.4 by halving 8 and halving 0.4 (Y5/6)	Mentally find 50% by halving and 25% by dividing by 4 or 2 of numbers and quantities- e.g. 25% of 150 by 150 ÷ 4 (Y6)