Holland Haven Primary School
Progression in the four rules of calculation
May 2024

This policy is written to ensure that consistency and progression takes place throughout the school. It has been reviewed by all the staff and agreed before being produced as a final policy.
Although there is a heavy emphasis on pencil and paper strategies it is also vitally important to remember that mental calculations MUST be encouraged daily and should not be seen separately to this policy but in correspondence to it.

Children should be encouraged to see mathematics as both a written and spoken language. Teachers should support and guide children through the following important stages:

- Developing the use of pictures and a mixture of words and symbols to represent numerical activities;
- using standard symbols and conventions;
- use of jottings to aid a mental strategy;
- use of pencil and paper procedures;
- use of a calculator.

It is important that children do not abandon jottings and mental methods once other pencil and paper procedures are introduced. Therefore children will always be encouraged to look at a calculation/problem and then decide which is the best method to choose: pictures, mental calculation (with or without jottings), structured recording or a calculator.

The long-term aim is for children to be able to select an efficient method of their choice (whether this be mental or written) that is appropriate for a given task. They will do this by always asking themselves:

- 'Can I do this in my head?'
- 'Can I do this in my head using drawings or jottings?'
- 'Do I need to use a pencil and paper procedure?'
- 'Do I need a calculator?

Place value: This section underpins all aspects of number and every term an assessment of children's place value knowledge should be carried out before setting out to teach a new method or concept to children. Without this understanding the whole concept of this 4-rules policy will not come to fruition.
Place value knowledge includes:

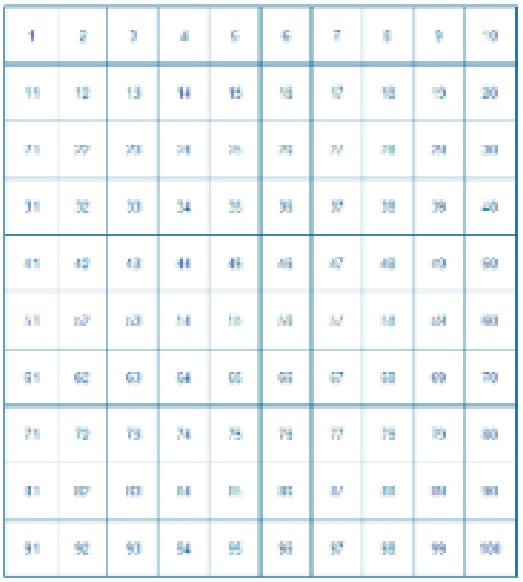
- Understanding numerals (counting and ordering)
- Rounding
- Estimating
- Context of decimals (including zero as a place holder)

Number lines: Number Lines are a vitally important tool in children's learning and understanding of place value. However we must not rush children from number tracks with every number on them to empty number lines. Instead it will be much more beneficial

to give children stepping stones to this stage.

Number tracks: Number tracks with no zero are an essential starting point for children in developing their understanding of the **ordinal and cardinal value of number**, as they aid the understanding of 1-1 correspondence between numbers and squares.

As children develop their understanding of larger numbers, they are often introduced to the hundred square, which when starting with one, is merely an extension of the number track.



Number line: As children's understanding of the ordinal and cardinal value of numbers becomes more secure, it is often considered time to move on to the use of a number line.

This differs from the number track in that it starts from zero. It is a more flexible tool for counting and calculating as it has an important role in developing children's

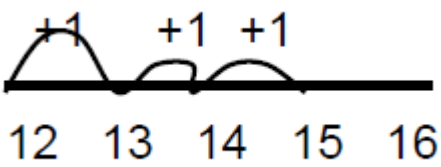
understanding of the importance of zero.

It is often considered helpful to display number lines in the classroom that include negative numbers, for example -20 to 100, so that the children in KS1 are aware and begin to understand that zero isn't the start of numbers, but that numbers go on and back below zero.

Before moving on to empty number lines we should consider using partially marked intervals to fully develop children's ordinal sense of number.

Empty number lines: Once children have mastered number lines with marked intervals, they are ready to use empty number lines. When they first start to number empty number lines it is important that they realise it is the marks not the spaces that are numbered.

Addition

<table>
<tr><th>Question</th><th>Typical Recording</th><th>Stage</th></tr>
<tr><td colspan="2">Counting, knowing the order of numbers, lots of practical activities with no written recording.</td><td rowspan="2">1</td></tr>
<tr><td>Jane has 3 bears. She was given 2 more. How many does she have now?</td><td>3 + 2 =5
  </td></tr>
<tr><td colspan="2">Using numbered tracks to help children physically jump forwards and backwards.</td><td rowspan="2">2</td></tr>
<tr><td>3 + 5 =</td><td> 
3+5=8
5+3=8</td></tr>
<tr><td colspan="2">Using an empty number line.</td><td rowspan="2">3</td></tr>
<tr><td>12 + 3 =</td><td> 
+1 +1 +1
12 13 14 15 16</td></tr>
</table>

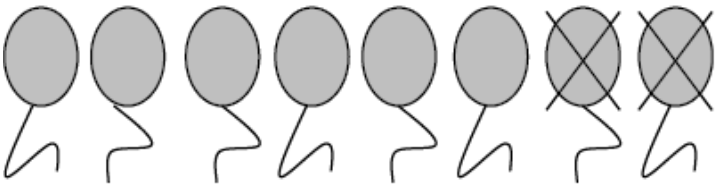
13 + 14 =	 13 23 +4 = 27	

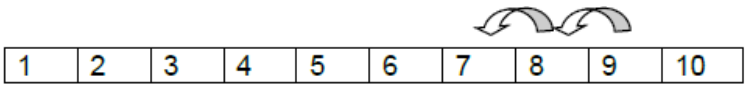
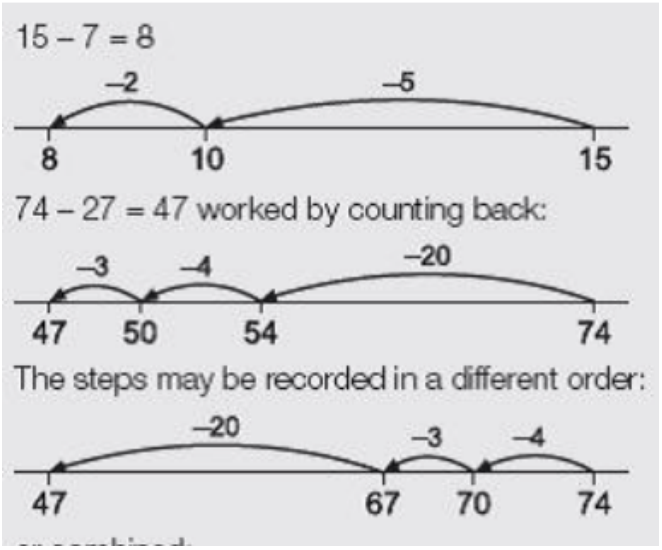
Add the tens and the units separately and then recombine. Then move on to placing the tens numbers in a column and the unit numbers in a column.		4
43 + 76 =	**= 40 + 70 + 3 + 6** 40 + 70 = 110 3 + 6 = 9 110 + 9 = 119	
43 + 76 =	E.g. 43 + 76 = 43 = 40 + 3 + 76 = 70 + 6 110 + 9 = 119	
Move on to a layout showing the addition of the tens to the tens and the units to the units separately. Add the units first!		5
87 + 45 =	87 + 45 12 (7 + 5) 120 (80 + 40) 132	
438 + 275 =	438 + 275 13 (8+5) 100 (30+70) 600 (400+200) 713	

In this compact, column method, recording is reduced further. Carry digits are recorded below the line, using the phrases 'carry ten' or 'carry one hundred' not carry one. This method can be applied to numbers with varying numbers of digits.	6

47 + 76 =	47 + 76 123 11	

Subtraction

Question	Typical Recording	Stage
Counting backwards, knowing the order of numbers, lots of practical activities with no written recording. Finding how many are left from a collection of objects when some are removed.		1
There were 8 balloons. Two popped. How many balloons are left?	8 – 2 = 6 	
Children also need practical activities around 'finding the difference', which involves making a comparison between the numbers in two groups of objects.		
How many more biscuits does Sally have than you?	(The biscuits are represented by counters). Sally's biscuits My biscuits 'Sally has 3 more than me' 	
Using numbered tracks to help children physically jump forwards		2

and backwards.		
There are 10 children in our class. Three are away today. How many are here?	10 – 3 = 7  	
Using an empty number line to either count back or count on to find the difference.		3
15 - 7=8 74 – 27 = 47	 	
Building on the number line, children partition and subtract mentally.		4
47 – 36 =	47 – 36 = 47 – 30 = 17 17 – 6 = 11	

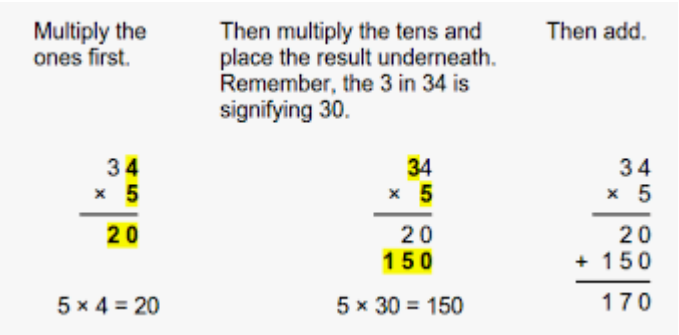
75 – 47 =	75 – 47 = 75 – 40 = 35 35 – 7 = 28	
Partitioning the numbers into tens and units and writing one under the other.		5

74 – 23 = 74 – 27 =	74 – 23 = 70 + 4 = 70 + 4 - 20 + 3 - <u>20 + 3</u> 50 + 1 = 51 74 – 23 = 51 This then leads on to decomposition, e.g. E.g. 74 - 27 = 70 + 4 / -20 + 7 = 60 14 / 7Ø + 4 / <u>- 20 + 7</u> / 40 + 7 74 – 27 = 47	
This method builds on the method from Stage 5 but is more compact.		6
74 – 27 = 563 – 271 =	This can be applied to three or four digit numbers: E.g. 74 - 27 = 6 14 / 7 4 / <u>-27</u> / 47 E.g. 563 - 271 = 4 16 / 5 6 3 / <u>-271</u> / 292	

Multiplication

<table>
<tr><th>Question</th><th>Typical Recording</th><th>Stage</th></tr>
<tr><td colspan="2">Use apparatus to sort objects into groups.</td><td rowspan="2">1</td></tr>
<tr><td>Sort six compare bears into 2 groups. How many in each group?</td><td>2 lots of 3
3 x 2
2 groups of 3</td></tr>
<tr><td colspan="2">Children will begin to recognise multiplication as repeated addition.</td><td rowspan="2">2</td></tr>
<tr><td>What is the value of 6 two pence coins?</td><td>2 + 2 + 2 + 2 + 2 + 2
6 groups of 2
2 x 6 = 12

+2 +2 +2 +2 +2 +2 1 2 3 4 5 6 7 8 9 10 11 12</td></tr>
<tr><td colspan="2">Partition the tens and the units. Multiply and then recombine to find the total.</td><td rowspan="2">3</td></tr>
<tr><td>43 x 4 =</td><td>43 x 4 = 40 + 3
X4
160 12 = 172

E.g. 43 x 4 = (40 + 3) x 4
(40 x 4) + (3 x4)
160 + 12 = 172</td></tr>
<tr><td colspan="2">Using long multiplication with two digits by one digit extending to two digits by two digits.</td><td rowspan="2">4</td></tr>
<tr><td>58 x 32 =</td><td> 
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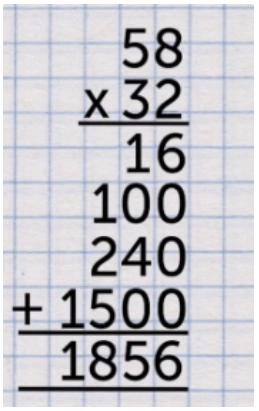
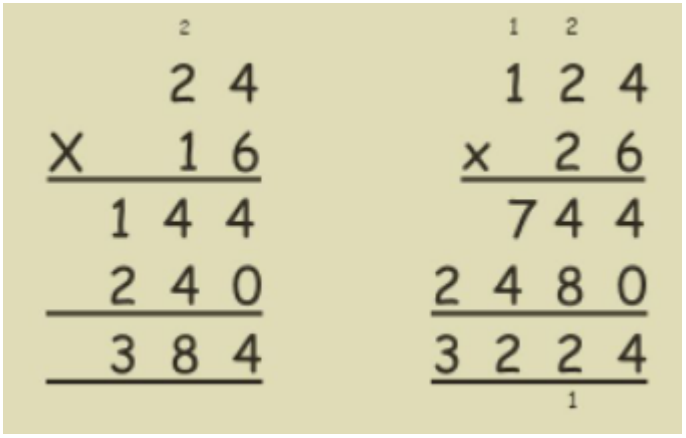
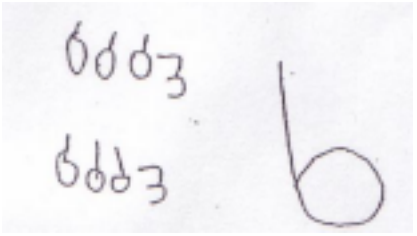
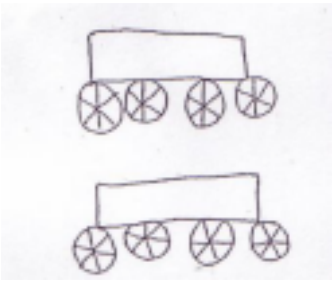
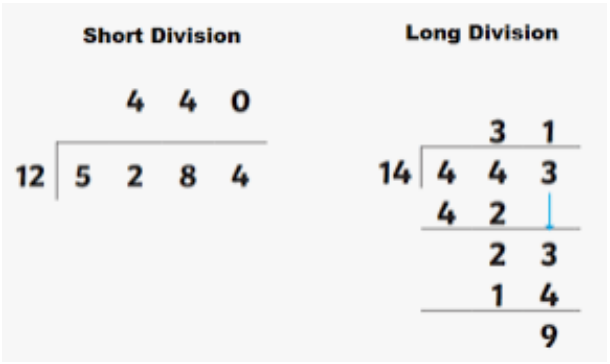
		
Using short multiplication with two digits by two digits extending to two digits by three digits.		

24x16= 124x26=			5
The grid method can be shown vertically. Children will choose which method they prefer to use.			6
56 x 27 =	56 X27 42 (6x7) 350 (50 x 7) 120 (6 x 20) 1000 (50 x 20) 1512 1 56 x 27 = 1512	This then leads on to: 56 X 27 392 (56x7) 1120 (56 x 20) 1512 1 56 x 27 = 1512	

Division

Question	Typical Recording	Stage
Young children will be familiar with the language of sharing and understand that six shared equally among three people means everyone has two each and that if they were shared between two people, both would have three.		1
		
Children can draw pictures to explain to someone else how they have solved a simple division problem.		2
How many cars can you make with 4 wheels each if you have eight wheels?		
Children will begin to recognise division as grouping or repeated subtraction.		3
12 ÷2= 24 ÷ 4	There are 12 sweets. How many people can have 2 sweets each? -2 -2 -2 -2 -2 -2 1 2 3 4 5 6 7 8 9 10 11 12 24 ÷ 4= 24 – 4 = 20 20 – 4 = 16 16 – 4 = 12	

	12 – 4 = 8 8 - 4 = 4 4 - 4 = 0 24 ÷ 4 = 6 (lots of 4 subtracted)	
Repeated subtraction on a number line can be used with larger numbers by taking away more than one group at a time.		4
65 ÷ 5 =	(5x6) (5x6) (5x1) 0 30 60 65 65 ÷ 5 = 13 65 (5x1) This can be used as a 60 step ready for short division using apparatus. Using a vertical (5x6) number line shows children how to use their times table facts when using repeated 30 subtraction on a number line. (5x6) 65 ÷ 5 = 13 0	
Short Division leading to long division		5

In readiness for year 7, more able year six children will be introduced to standard written methods of long division, looking at other written methods.		6
972 ÷ 36= 634 ÷ 5 =	36 972 - 720 (36x20) 252 - 252 (36x7) 0 = 20+7=27 At this stage remainders may now be divided further leading to a decimal answer. 634 ÷ 5= 126.8 5 634.0	
If children are struggling to make the link between practical and abstract mathematics, but they are capable of following steps to solve answers, short division maybe the method required.		7

	 118 ÷ 6 = 118 r5	

	e.g. 586 ÷ 7 = 83.71	