Northbourne CE (A) Primary School

Calculation policy:
Multiplication and division

Aims and background

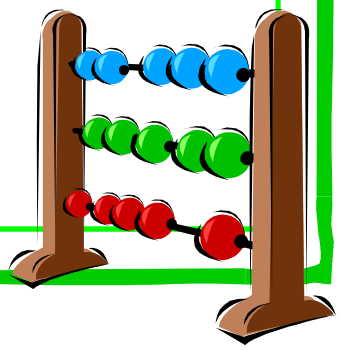
The National Curriculum for maths is based on **3 key aims**:

- Pupils' developing fluency in the fundamentals of mathematics so that they develop conceptual understanding and the ability to recall and use maths rapidly and accurately
- Being able to use reasoning and generalisation to develop an argument or proof
- Developing pupils' ability to solve problems by applying maths to a range of increasingly complex problems

Being able to calculate effectively underpins all of these aims. At Northbourne, pupils are introduced to calculating through practical, oral and mental activities. As pupils become more able to record their thinking, their mental methods are strengthened and informal written methods are introduced. These methods become increasingly efficient and refined, leading to the use of traditional compact written methods.

The aim of this policy is to ensure all members of our school community – children, parents and children - understand the progression through the stages of developing fluency with written methods. This will ensure it is taught, explained and understood in a way which is systematic and consistent.
Teaching of each calculation method includes:

- Effective use of a range of structured apparatus, as shown in the rest of this policy
- Use of visual images and models
- Parallel teaching of the inverse operation to strengthen pupils' understanding of links between different areas of maths
- Wider context – in the form of, for example, word problems – to ensure pupils understand when the strategy might be applied



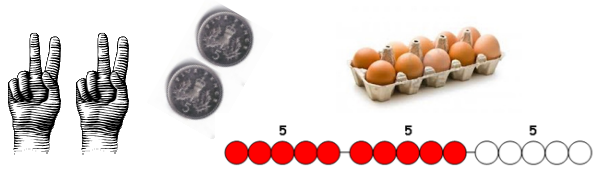
Multiplication

Before and while developing written strategies...

Children will be learning mental multiplication and division facts. These are typically tested each week, with these tests being tailored to the set of facts each child is learning. More information is included in our Homework Policy.

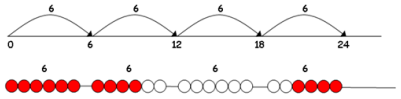
Stage One: Understanding what multiplication is

Children are helped to develop their conceptual understanding of what multiplication is using a range of pictures, images, objects and apparatus.



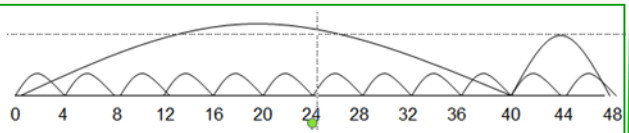
Stage Two: Multiplication as repeated addition

Children learn that multiplication is the same as adding repeatedly—therefore, 4 x 6 is the same as 6 + 6 + 6 + 6—and also find out that it can be done in either order—that is, 4 x 6 is the same as 6 x 4. This is shown through arrays and number lines.



Stage Three: TU x U using a number line

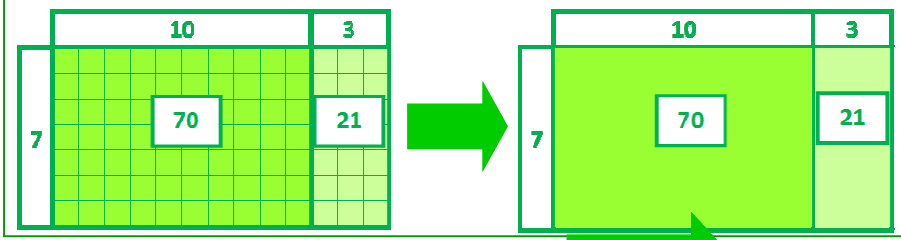
Children start to use an empty number line to multiply by 'chunking' efficiently. In the example here, 4 x 12 is first approached by adding 4 12 times (the smaller jumps on the number line). As the child develops confidence, they learn to take larger jumps—that is, multiply 10 by 4 first (as this is a known fact), and then add on 2 more jumps of 4.



	10	3
3 x 13		

Stage Four: Using arrays to represent multiplication

Arrays are used to physically represent multiplication. These are initially pictoral, as shown on the left, before becoming more symbolic; this helps the child start to use the grid method for multiplication. Alongside these strategies, both methods are shown in an expanded form of calculation to help lead into later compact methods.



7 x 13 = 91

7 x 10 = 70
7 x 3 = 21

(Stage Six, below)

13
x7
91
2

Stage Five: Grid -> long multiplication

The grid method, used for larger numbers, is shown alongside an expanded form of written multiplication...

	30	8
10	300	80
4	120	32

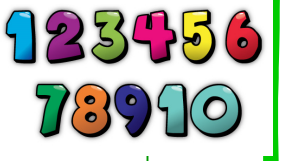
38
x 14
32 (8x4)
120 (30x4)
80 (8x10)
300 (30x10)
532

Stage Six: Grid -> short multiplication

...and, when children are secure, the more formal short multiplication method will be introduced.

	30	8
10	300	80
4	120	32

38
x 14
144
2
380
524



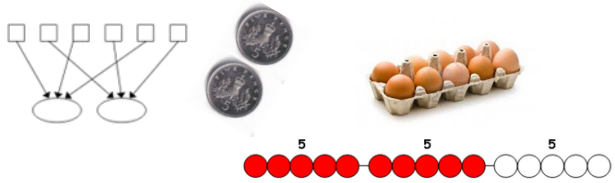
Vocabulary to use...

4 ***lots of*** 6 = 24, 4 ***sets of*** 6 = 24, 4 ***groups of*** 6 = 24, 4 ***times*** 6 = 24, 4 ***multiplied by*** 6 = 24, the ***product of*** 4 and 6 = 24

Division

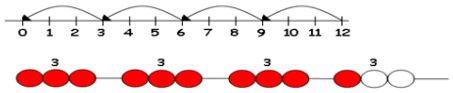
Stage One: Understanding what division is

Children are taught that division represents 2 different concepts—grouping and sharing



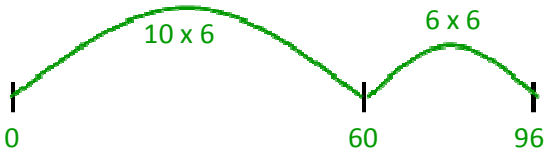
Stage Two: Understanding division as repeated subtraction

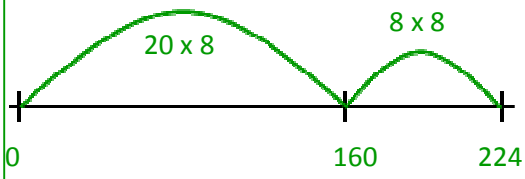
Children learn that division is the same as subtracting Repeatedly—so, 12 ÷ 3 is the same as subtracting 3 from 12 until no more can be taken away, and counting how many times this was possible.



Stage Three: TU ÷ U using a number line

Children start to use an empty number line to divide by counting on in chunks of the number being divide by. In the example here, 96 ÷ 6 is first approached by adding a chunk of 10 6s (as this is a times table fact which is well-known). The child then finds the difference between 60 and 96, and can use their known times table facts to recognise that this (36) is made up of 6 lots of 6. They can then add the separate chunks of 10 and 6 to find the answer.





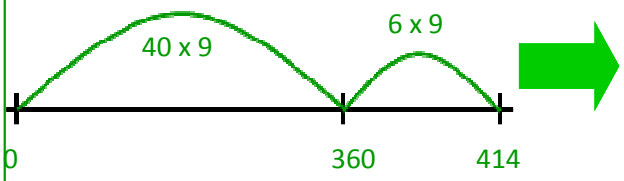
8 | 224
- 160 (8 x 20)
64
- 64 (8 x 8)
0

Stage Four: HTU and TU ÷ U using a number line

As children develop confidence and fluency with this method, they will start to apply it to chunking involving dividing by larger numbers. Alongside this, recording will also be modelled in an expanded version of the long division method. Remainders will not be present, except when working in practical contexts.

Stage Five: Up to ThHTU ÷ U, related to long division

As a progression from stage four, children continue to use chunking but start to record this similarly to how they would record long division. As children become more confident, they are encouraged to use larger 'chunks' to ensure the method is as efficient as possible, before being introduced to the short division method. This is always done initially using a range of structured apparatus and equipment, to ensure development of deep conceptual understanding. So, for example, for 415 ÷ 9



$46\frac{1}{9}$

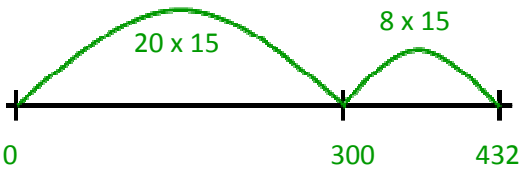
9 | 415
- 360 (9 x 40)
55
- 54 (9 x 6)
1

4 6 r1 -> $46\frac{1}{9}$

9 | 4 1 5

Stage Six: Up to ThHTU ÷ TU using a number line

By this stage the National Curriculum outlines the requirement that children should be able to use formal written methods, including long and short division. As with earlier stages, these methods are introduced alongside those taught previously to ensure children retain a clear understanding of their calculation. So, for example, 432 ÷ 15 would be tackled...



			2	8	
1	5	4	3	2	
		3	0	0	15×20
		1	3	2	
		1	2	0	15×8
			1	2	

$\frac{12}{15} = \frac{4}{5}$

Answer: $28\frac{4}{5}$