Malmesbury Park Primary School

Division

Welcome!

This booklet is designed to show the progression of key written calculation methods taught across the school from Year R to Year 6. These methods build on the children's developing understanding of number, with the aim of becoming more efficient and succinct.

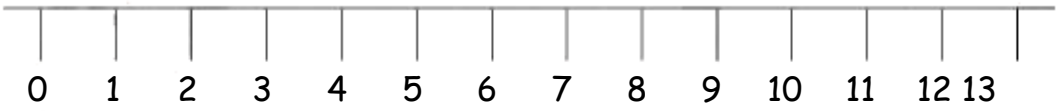
We hope that this booklet will help to explain some of the newer calculation methods we use in school as well as enabling you to work with your child at home with their maths. As the methods are taught in progression through the school, when helping your child, we recommend you start by looking at the method they have most recently been taught at school.

Glossary

Array – An array is a systematic arrangement of objects, usually in columns and rows and is used as an image to represent multiplication.

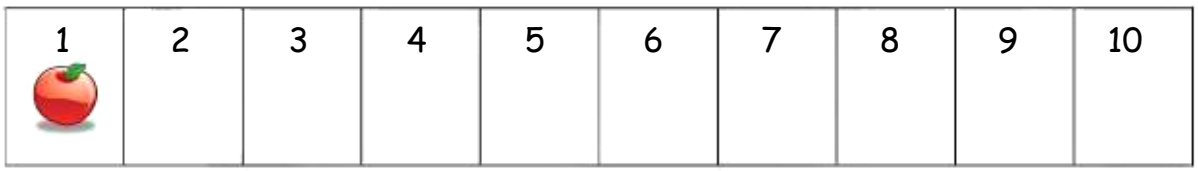
3x2=6

Number line – A line marked with numbers used by children to help them with their calculations. Number lines can be 'structured' with numbers already marked on, or 'unstructured' without numbers marked on.



Number sentence – the calculation written out with the answer.
e.g. 10 ÷ 3 = 3 r 1

Number track – A track marked with numbers. Children can place objects on the track to help them count.



Partitioning – Splitting a number into each digit's place value. For example, if we partitioned the number 382 we would recognise it is made up of 300 + 80 + 2 or 3 hundreds 8 tens 2 units.

Place Value – The value of a digit within a number. For example, the place value of the digit 8 in the number 382 is 80 or 8 tens.

Key for Arrows

A 'jump' forward (counting on) or backwards (counting back). The size of the jump is written above the arrow.

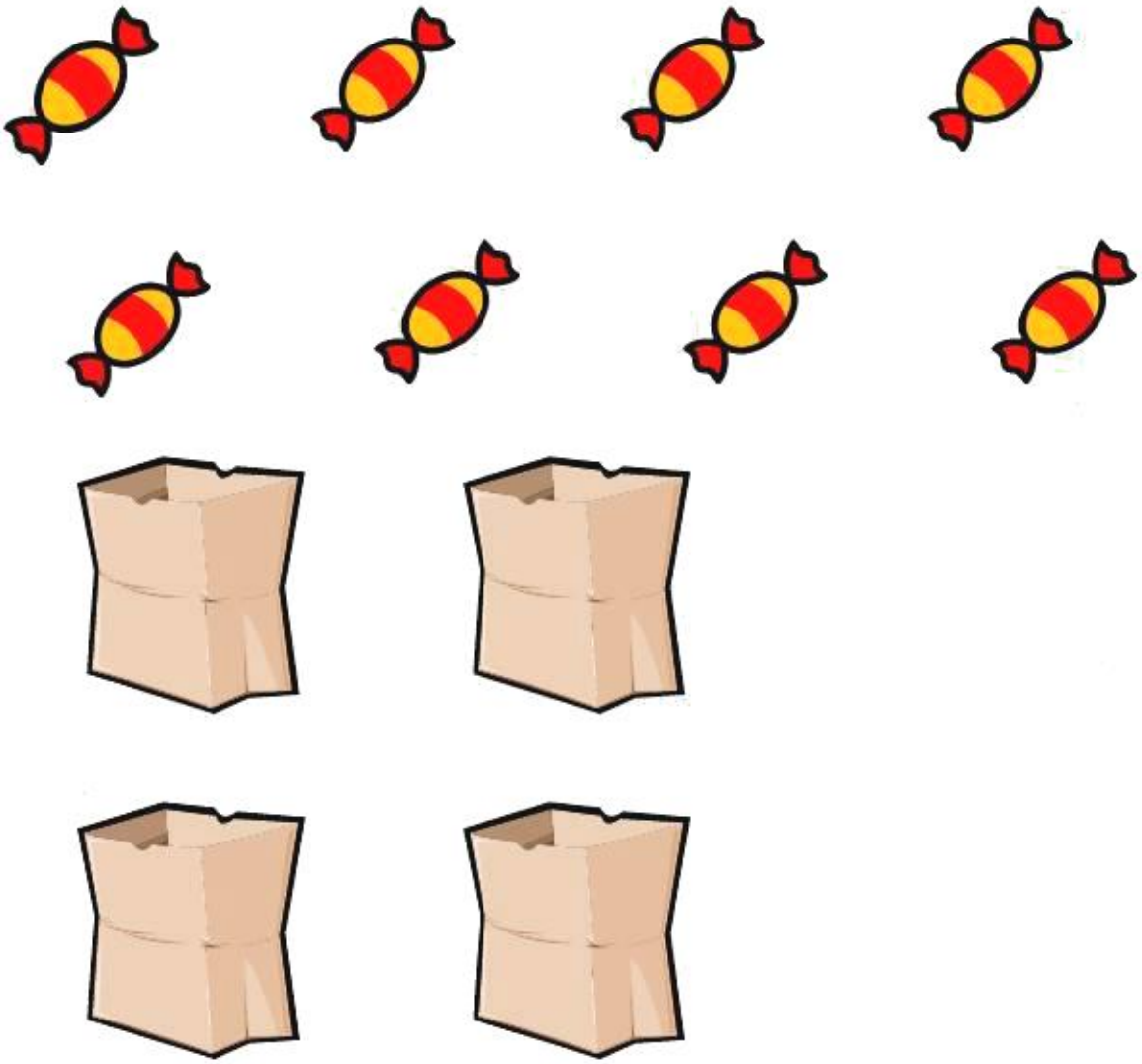
1. Division by sharing with objects

In order to do this, children must:

- ✓ Be able to count on and back in different steps
- ✓ Be able to count in 2"s, 5"s and 10"s and link this knowledge to multiplication facts

This forms the initial stage of a child's understanding of the concept of division. Using concrete objects, items are physically shared out equally into bags, pots or piles, one at a time.

Example problem: If 8 sweets are shared equally between 4 people into paper bags. How many sweets must be put in each bag?



The children begin by counting out the sweets and then sharing them into the bags, making sure there is an equal amount in each. They then count how many sweets are in each bag.

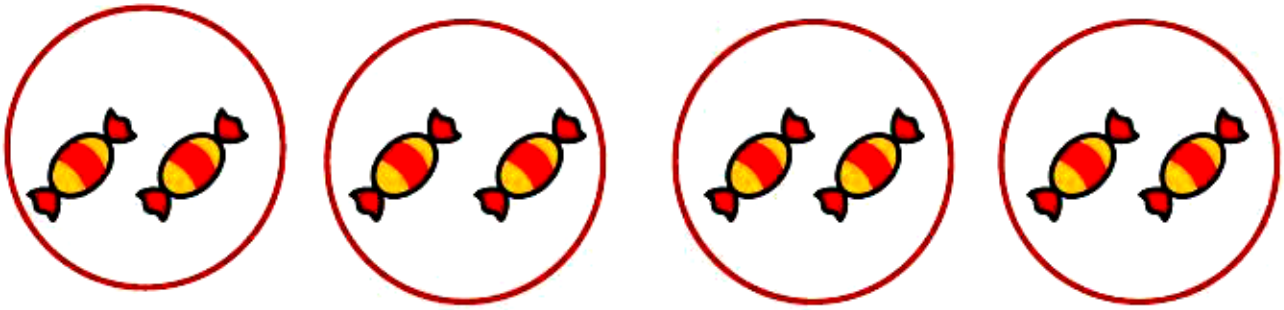
2. Division by grouping with pictures or symbols

In order to do this, children must:

- ✓ Be able to count on and back in different steps
- ✓ Be able to count or add up in 2's, 3's, 4's and 5's and 10's and link this knowledge to multiplication and division facts
- ✓ Be beginning to understand the concept of remainders (how many left over?)

At this stage, the children move on to using pictorial representations of the objects, and circle them to illustrate groups of equal size.

Example question: 8 sweets are shared out between 4 people, how many sweets does each person get?



Eventually the children will be confident enough to use symbols or even just dots to represent the objects or share out a number.

Calculations here may not always divide exactly and can have remainders. The children would need to be clear that the groups must be the same size (it wouldn't be fair if someone got an extra sweet!)

Example problem: 10 footballs are put into 3 holdalls. How many footballs are in each holdall?

Children here record their answers as a number sentence.
10 ÷ 3 = 3 with 1 left over. This is written as 3 r 1 (3 remainder 1)

3. Division by grouping on a structured number line

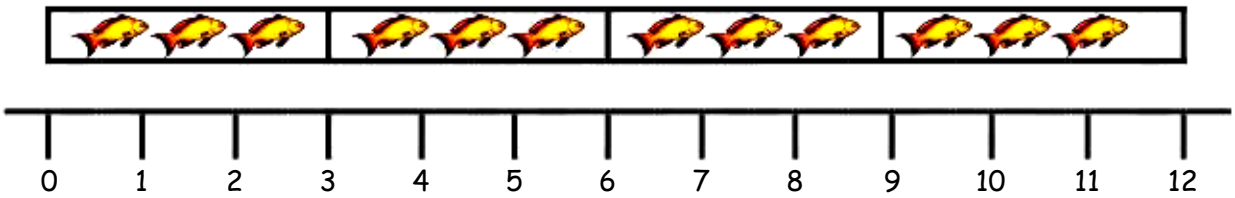
In order to do this, children must:

- ✓ Be able to count on and back in different steps
- ✓ Be able to count or add up in 2's, 3's, 4's and 5's and 10's
- ✓ Recognise the link between multiplication and division
- ✓ Understand the concept of remainders (how many left over?)

At this step, the emphasis of the calculation is changed from knowing how many groups there are and finding how many in each group, to knowing how many are in each group and instead finding out how many groups are needed. This distinction helps children to visualise the division on a number line, as shown below:

Example problem: 12 fish are shared with 3 in each bowl, how many bowls are needed?

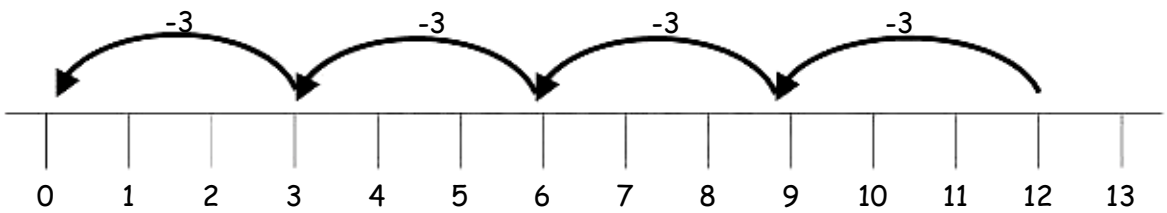
Children place grouped pictures of the fish onto a structured number line, to show how many groups are needed to reach the number being divided.



So, 4 lots of 3 make 12, or 3 goes into 12, 4 times.

In terms of language, we talk about 'how many lots of…make…' or 'how many times does … go into…' The phrase 'how many times' is particularly used to reinforce the link between multiplication and division.

Children begin to record on a structured number line without the pictures to aid.



Children here record their answers as a number sentence.
12 ÷ 3 = 4

4. Division as repeated subtraction on an unstructured number line

In order to do this, children must:

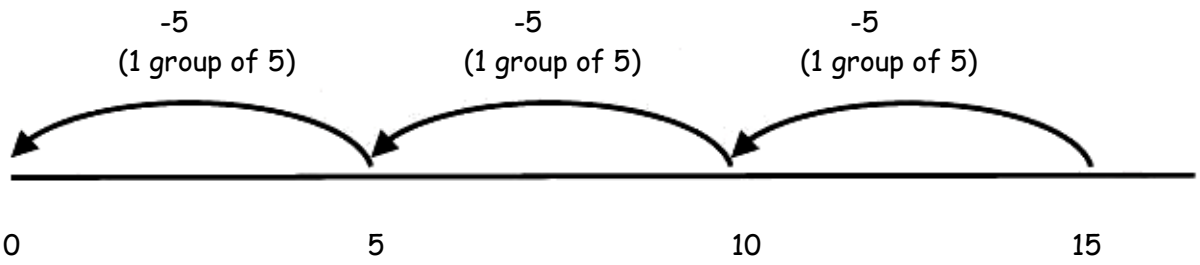
- ✓ Understand the relationship between multiplication and division
- ✓ Continue to have experiences of remainders
- ✓ Have knowledge of multiplication facts and link these to division facts

Children progress here to drawing their own blank number line and recording the number of jumps (or groups of the number they are dividing by) they can fit into the number they are dividing.

Example problem: If I put 5 sweets into a bag, how many bags do I need for 15 sweets?

15 ÷ 5 =

Children count back from 15 in jumps (groups) of 5, until they reach 0 (or as close to 0 as they can get).



As the numbers the children are dividing become larger, they will need to draw on multiplication facts already known to them to help them solve problems more quickly.

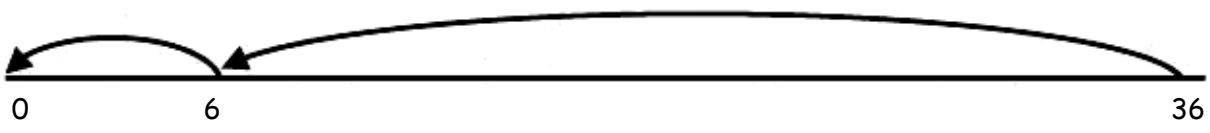
Example problem: 36 puppies were sleepy and went to sleep with 3 tucked up in each cosy bed. How many beds did the puppies fall asleep in?

36 ÷ 3 =

Children may recognise here that 10 lots of 3 is 30, and so this can be subtracted as one jump.

-6- 30

(2 groups of 3)(10 groups of 3)



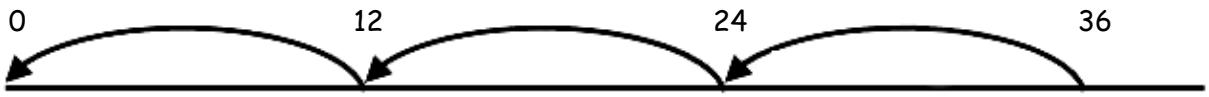
So 36 ÷ 3 = 12 (10 groups + 2 groups)

As the pictures are no longer required, children can solve problems where the group size is unknown just as easily as when the number of groups is unknown. The above question could be rephrased as:

36 puppies were sleepy and went to sleep in 12 cosy beds. How many puppies went to sleep in each bed?

36 ÷ 12 = 3

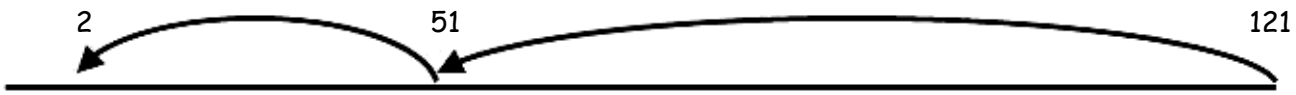
- 12 -12 - 12



The children can also solve problems with remainders using this method.

Example problem: £121 of pocket money was shared between 7 children. How much money did each child receive?

-49 (7 lots of 7) -70 (10 lots of 7)



121 ÷ 7 = 17 r 2

5. Chunking

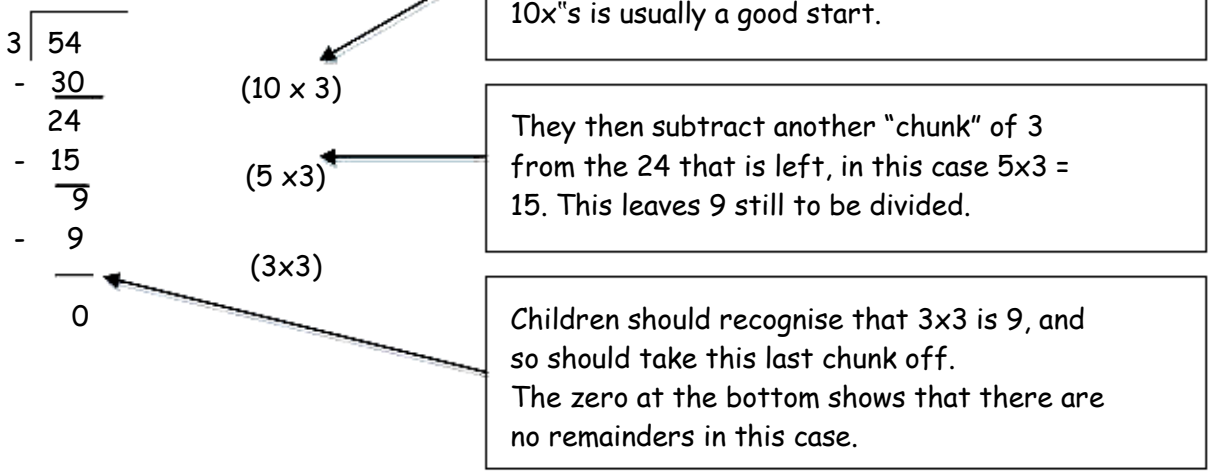
In order to do this, children must:

- ✓ Have knowledge of multiplication facts and link these to division facts
- ✓ Recall times tables up to 10x10
- ✓ Be able to multiply by 10 and 100
- ✓ Link division to repeated subtraction

Chunking is an informal introduction to formal long division, and is based on subtracting multiples of the given divisor (number we are dividing by) from the number we are dividing.

It is set out like the formal division method, under the 'bus-stop'.

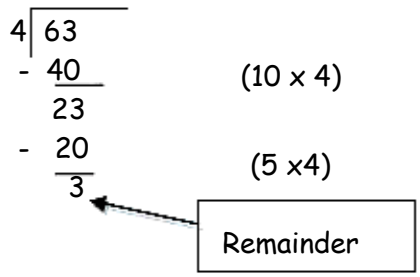
Example problem: 54 ÷ 3 =



The answer is found by adding together the individual chunks that were taken off.
10 + 5 + 3 = 18 so 54 ÷ 3 = 18

Remainders are shown at the bottom of the column, as a number that is smaller than the number we were dividing by.

Example problem: 63 ÷ 4 = 15 r 3



As children become more confident with this method for division, the actual 'chunking' can become more efficient and can be completed in less steps.

6. Long Division

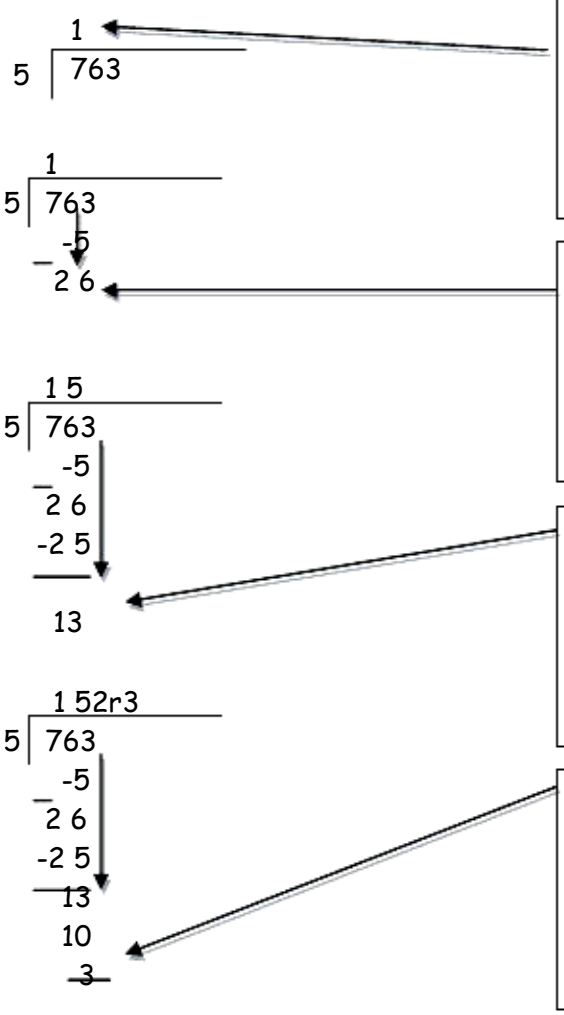
In order to do this, children must:

- ✓ Recall times tables up to 10x10
- ✓ Have secure place value knowledge and be able to hold a number's place value mentally

Whilst chunking can work well with smaller calculations, once children begin to divide larger numbers, it can become inefficient, so long division is taught. This is a similar method to 'short' division, but rather than writing the remainder next to the number being divided, we work it out underneath.

Example problem: 763 ÷ 5 =

Children begin much the same way as the chunking method, by setting out the calculation in a 'bus-stop'.



Children start by asking "how many times does 5 go into 7?" The answer of 1 is written above the 7 on top of the 'bus stop'. (It is important to keep in mind that the 1 actually represents 1-hundred.)

As 1 x 5 = 5 , 5 is then subtracted from the 7, and the 2 remaining written underneath. The 6 is brought down, and 5's into 26 is calculated, giving 5 remainder 1. The 5 is written next to the 1, above the 'bus stop'.

As 5 x 5 = 25, 25 is subtracted from 26 to leave the remainder (1). The 3 is now brought down, and 5's into 13 is calculated, giving 2 remainder 3. The 2 is written next to the 5 above the 'bus stop'.

As 2 x 5 = 10, 10 is subtracted from 13 to leave the remainder (3). As 3 is less than 5, we can be certain we cannot divide further and so the 3 is then added to the answer above the 'bus stop' as a remainder.

7. Short Division

In order to do this, children must:

- ✓ Recall times tables up to 10x10
- ✓ Have secure place value knowledge and be able to hold a number's place value mentally
- ✓ Be able to subtract mentally to find remainders

Once children are confident with long division they may progress to using the more efficient method of short division. This can also be used when calculating in decimals.

Example problem: 763 ÷ 5

Children start exactly as before by asking "how many times does 5 go into 7?" The answer of 1 is written above the 7 on top of the 'bus stop'.
The 2 remaining is written to the left of the 6.

Next, 5's into 26 is calculated, giving 5 remainder 1. The 5 is written next to the 1 above the bus stop. The remainder (1) is written to the left of the 3.

Finally, 5's into 13 is calculated, giving 2 remainder 3. This is written next to the 5 above the bus stop to complete the calculation.

This method can also be used when dividing by 2-digit numbers.

Example problem: 362 ÷ 12

The calculation is set out as before. As 3 cannot be wholly divided by 12, a 0 is written above the 3 on top of the bus stop, and 12's into 36 is calculated.

12's into 36 gives 3, remainder 0.
The 3 is written above the bus stop, and 12's into 2 is calculated.

As 2 cannot be wholly divided by 12, another 0 is written above the bus stop and the 2 noted as a remainder (this can be seen as '12's into 2 are 0 remainder 2).