Ingleby Mill Primary School

Calculation policy

This calculation policy has been written in response to the National Curriculum 2014 for the teaching and learning of Mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Early learning in number and calculation in Reception follows the Development Matters EYFS documentation and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Non-negotiable written method table

Year group	Addition	Subtraction	Multiplication	Division
Reception into Y1 and Y2	Pictorial representations Number lines Column Method (usually expanded)	Pictorial Representations Number Lines	Pictorial Representations Arrays	Pictorial Grouping
Y3 and Y4	Column Addition	Column subtraction	Short Multiplication	Bus Stop (short division)
Y5 and Y6	Column Addition	Column subtraction	Short Multiplication Long Multiplication	Bus Stop (short division) Long Division

Y1 and Y2

Year 1 and Year 2

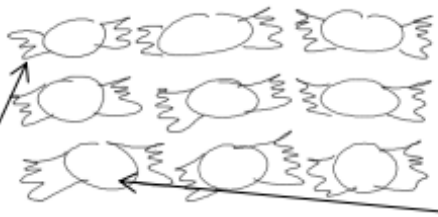
Addition

Initially, pictures will be used to solve problems with addition. Children will count totals starting at the number one and later starting on the highest number and counting up.

Example: If I had 6 sweets and then got 3 more, how many would I have in total?

Children will begin by using one-to-one correspondence to count totals of numbers.

1, 2, 3, 4, 5, 6, 7, 8, 9 (pointing to each object as they count.



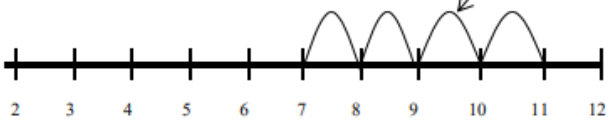
As children become more confident with addition and counting, they will begin at the larger number and count the remaining steps.

7, 8, 9.

This will progress onto children using a number line to count up from one number to another.

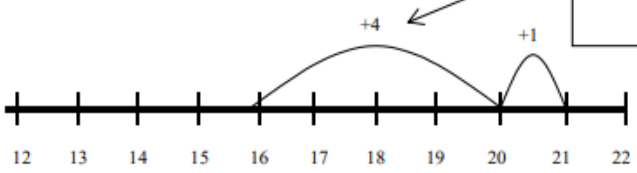
Example: 7 + 4 =

Starting on the larger number and counting the remaining steps (represented as 'jumps').

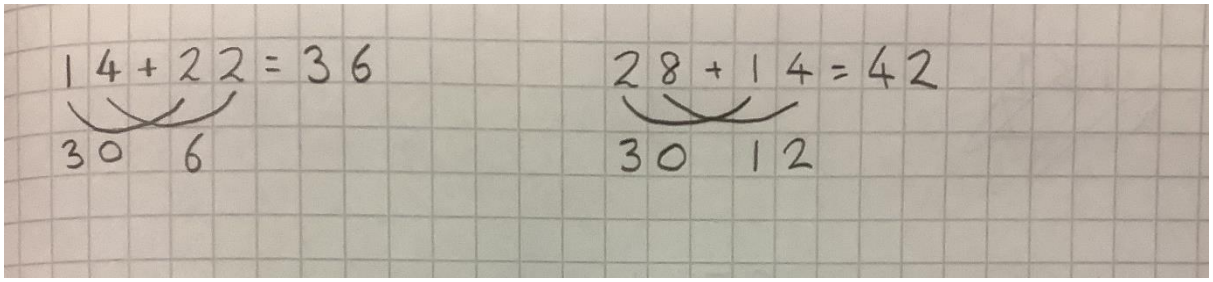


As children become more confident with number bonds and partitioning of numbers, larger jumps can be made.

Knowledge of number bonds to 20 has been used (adding 4) then knowledge of partitioning (5 is made up of 4 and 1).



When adding two two-digit numbers. Children are taught to use the ribbon method.

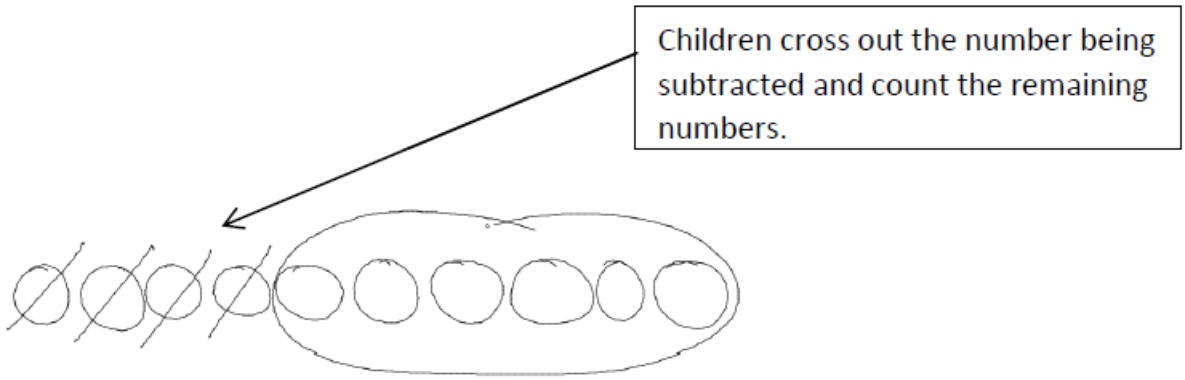


Year 1 and Year 2

Subtraction

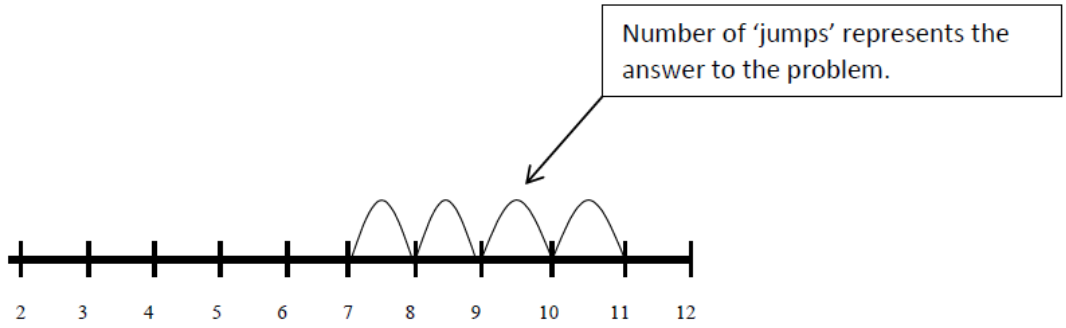
Similarly to addition, children will begin to tackle subtraction problems using pictorial representations which they can manipulate to find the answer.

Example: 10 – 4

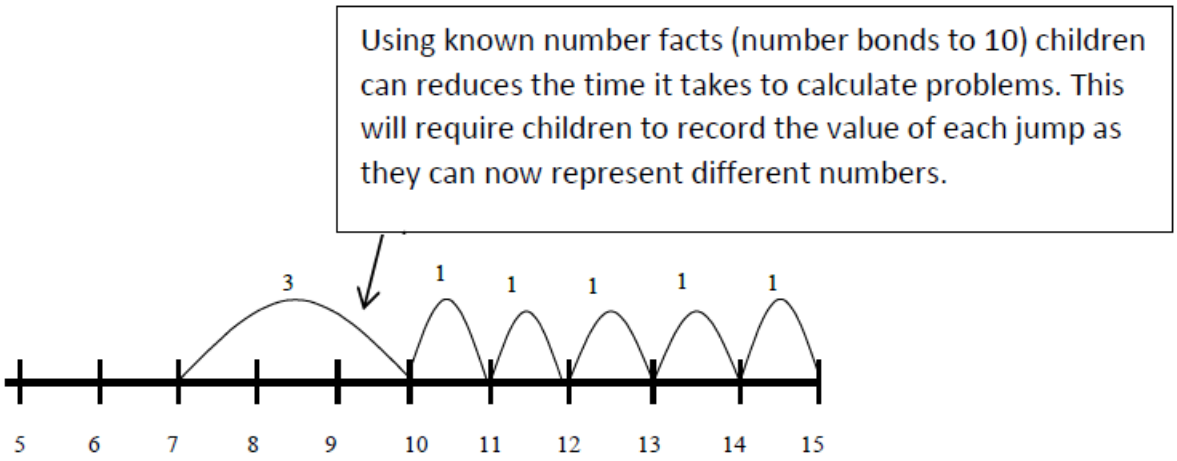


This will develop on to children using a number line to represent. Children will count up from the smaller digit to the larger digit in jumps of one.

Example: 11 – 7

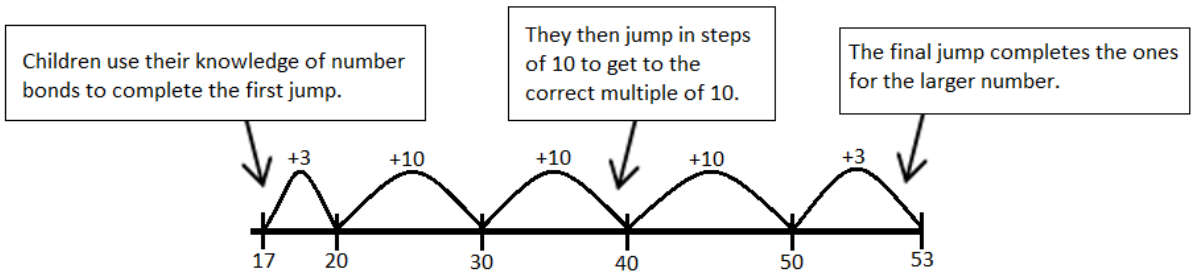


Example: 15 - 7



This is taken further when subtracting 2-digit numbers.

Example: 53 – 17 = 36



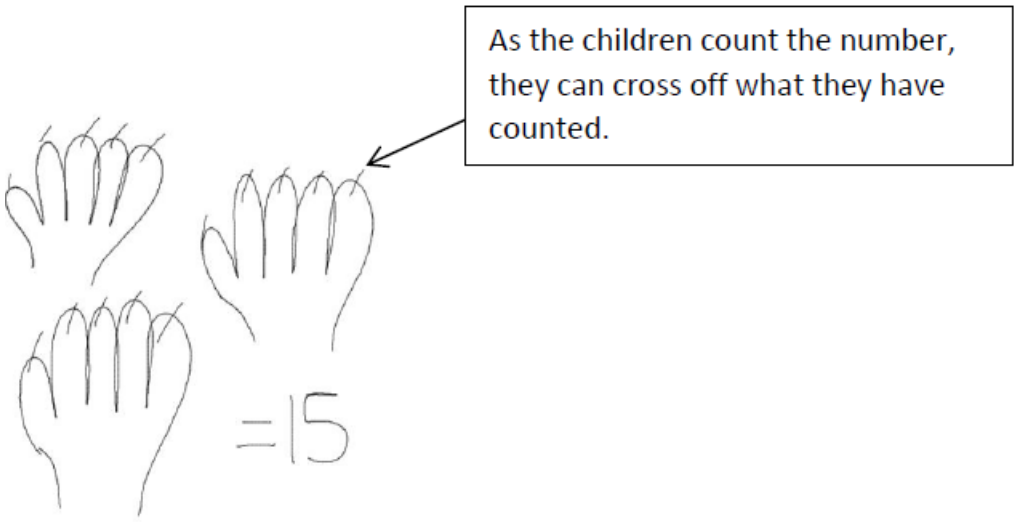
Once the jumps have been completed, the children add them to find the difference.

Year 1 and Year 2

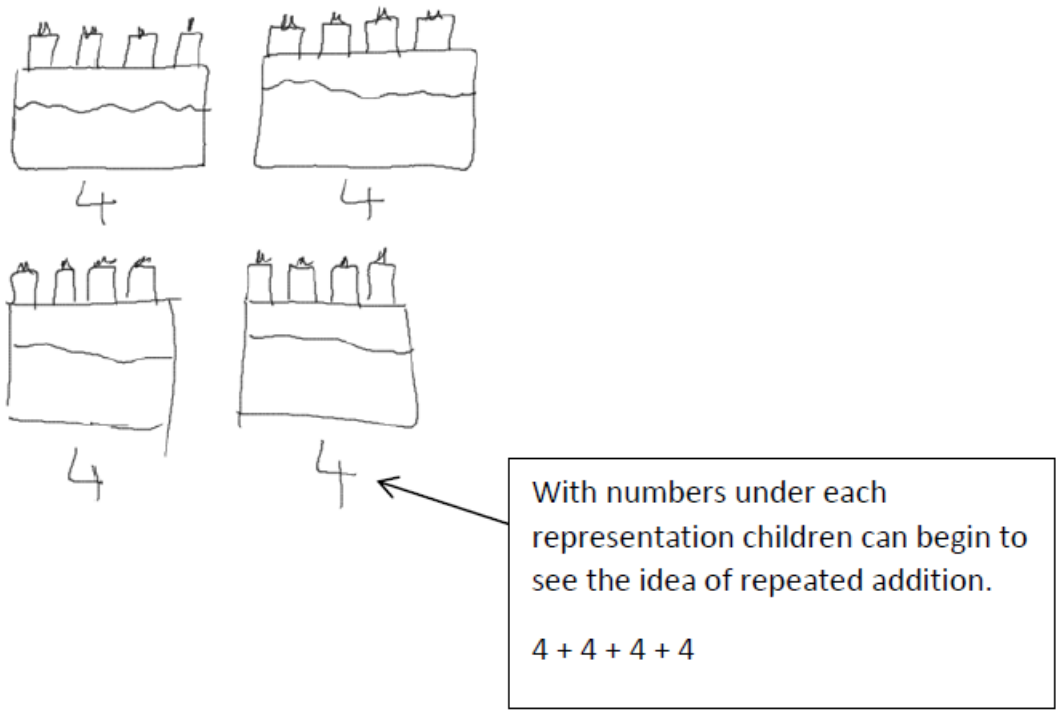
Multiplication

Multiplication begins with children practically grouping and counting sets of objects in sets of ones, twos or fives. This will progress onto pictorial representations of problems.

Example: One hand has 5 fingers, how many fingers are on 3 hands altogether?

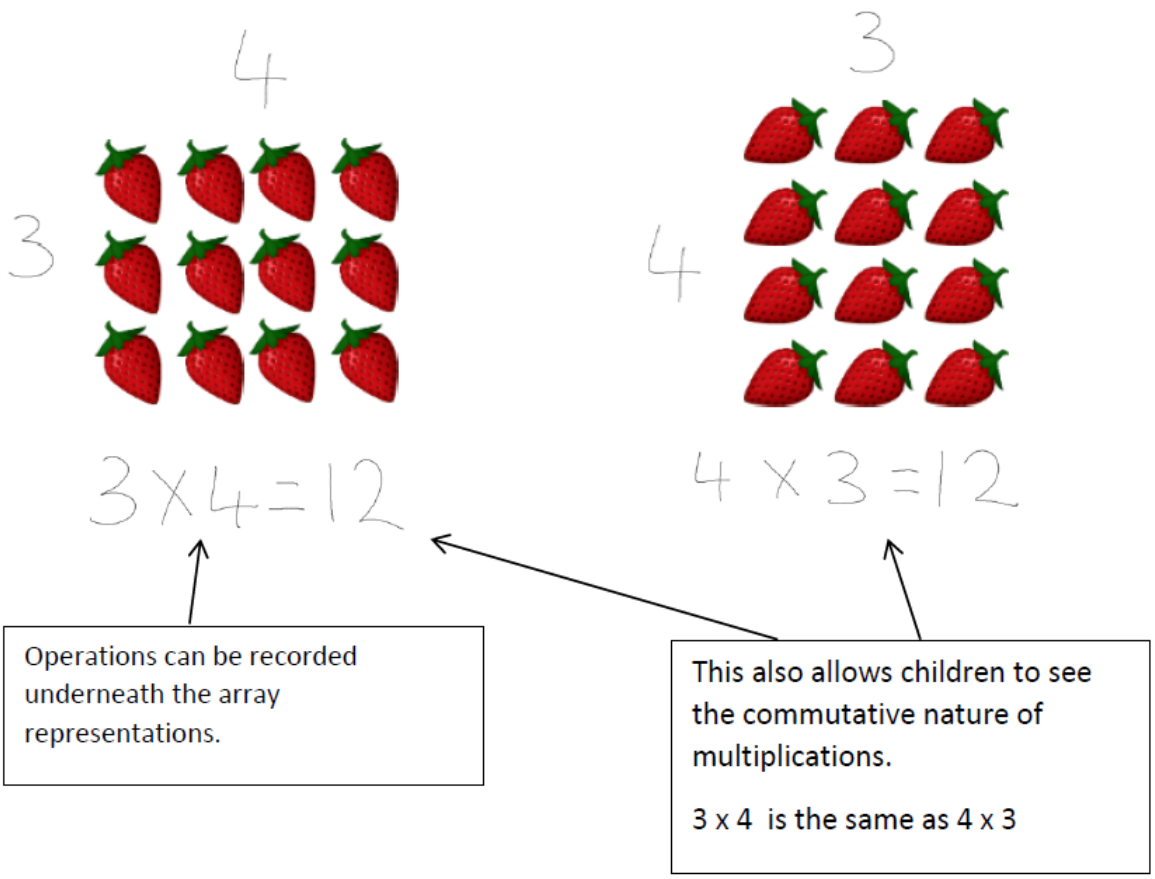


Eventually, children will record numbers alongside their representations.
Example: One cake has 4 candles on it, how many candles would 4 cakes have altogether?

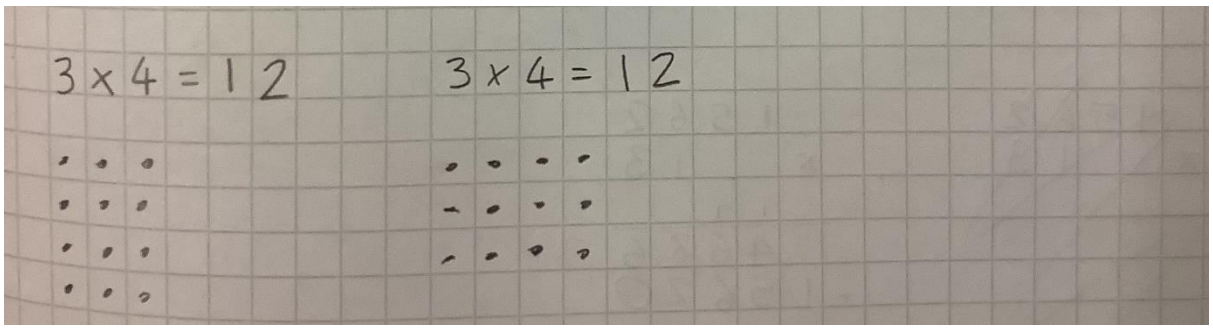


The next stage is for children to record problems as arrays.

Example: You get 4 strawberries in 1 packet, how many are in 3 packets in total?



The children will draw arrays like this in their books.

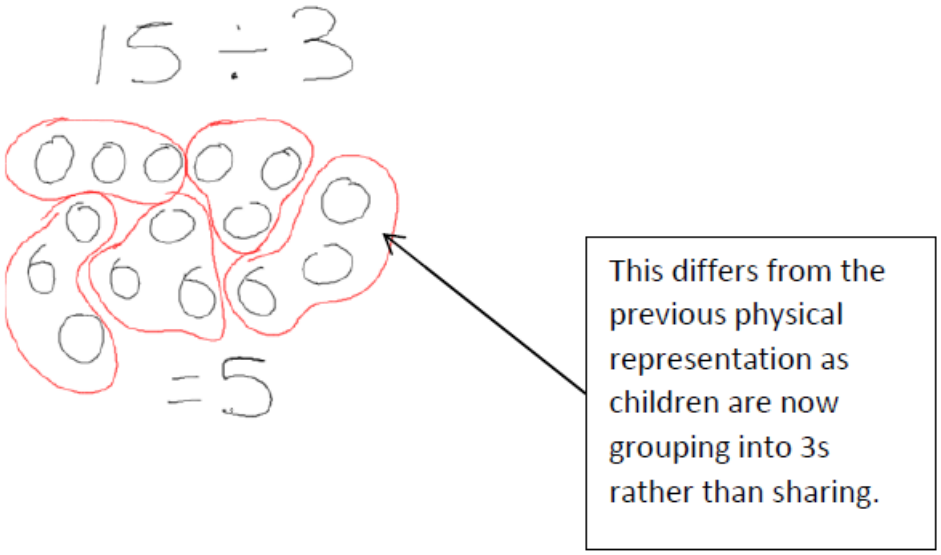


Year 1 and Year 2

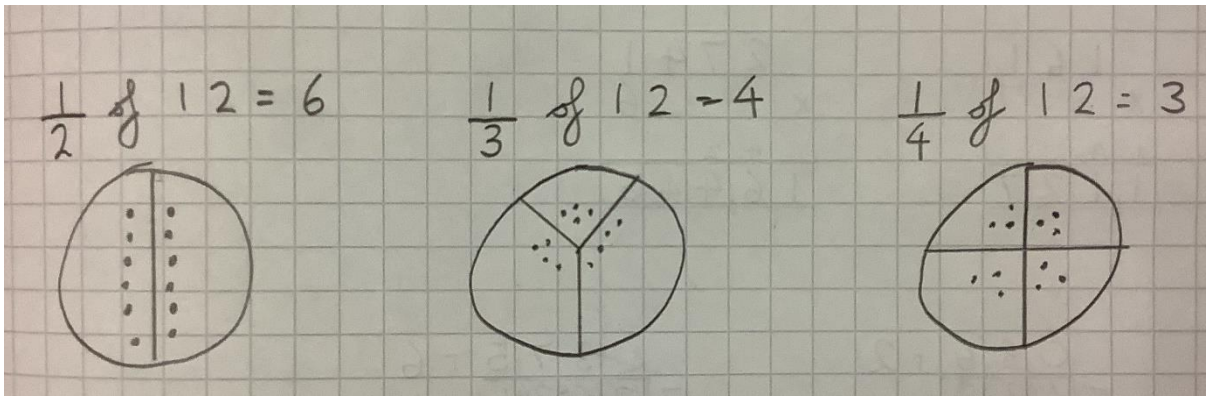
Division

Division will begin with children physically dividing (sharing) objects into equal groups.
Example: There are 12 football players and 3 teams, if you share the football players out equally, how many players will there be on each team?

Early recordings will be pictorial representations that the children can divide by circling groups.
Example: There are 15 children working in groups of 3. How many groups are there going to be?



Children also use division to find fractions of amounts. To support this, pictorially, children draw the representation of a fraction and share the whole number into the parts of the fraction.

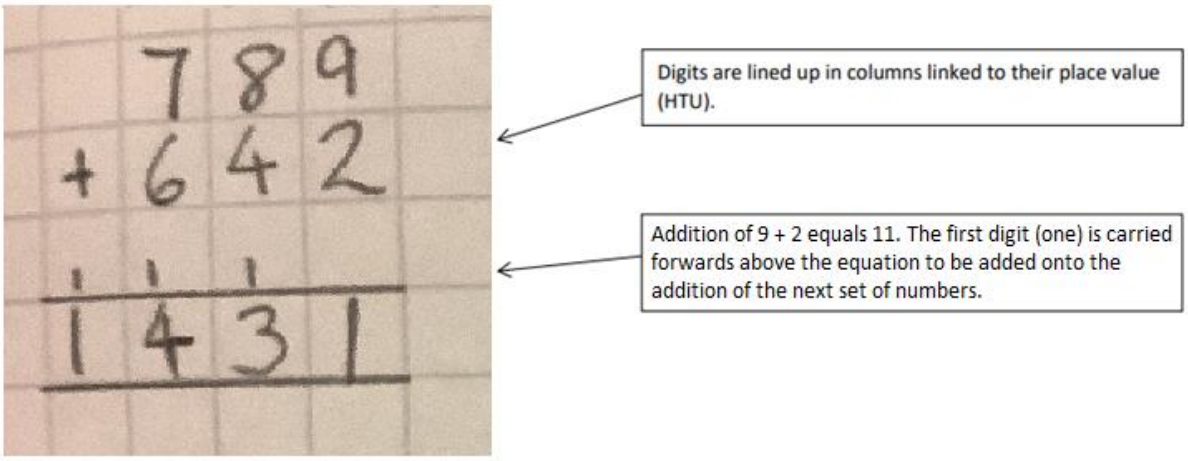


Y3 and Y4

Year 3 and Year 4

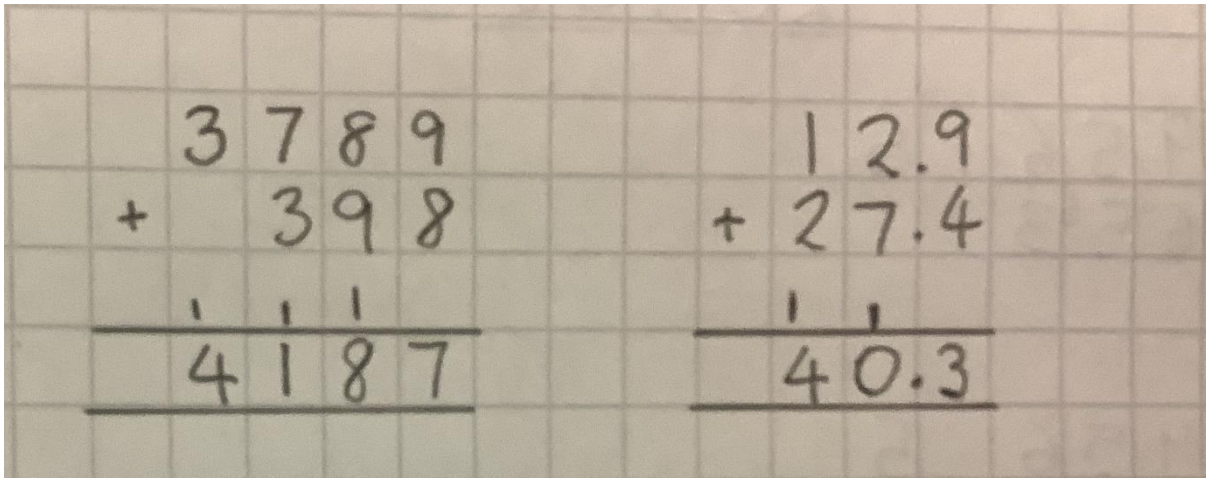
Addition

In years 3 and 4, children will swiftly move into a standard formal written method of addition (column method). Calculations will be recorded with each digit in place value order vertically. Calculations beginning on the right, carrying forward any additions that create a 2-digit answer.



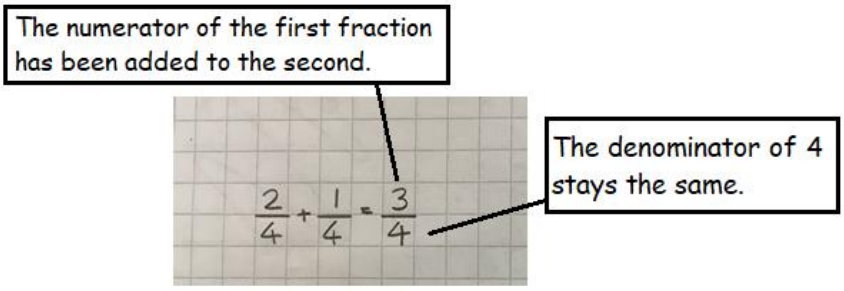
Extension and Progression

With a consolidated method in addition, children will be extended through number of digits, decimal number and numbers of varied length.



Fractions

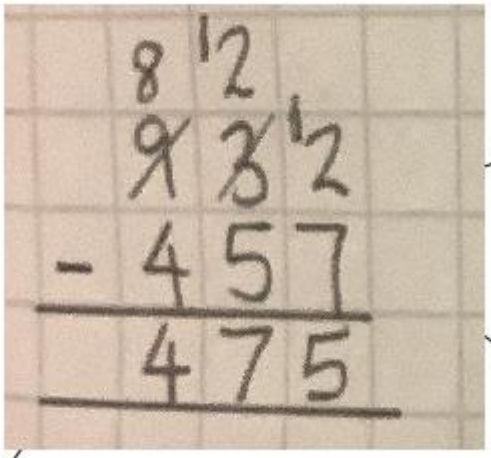
In year 3 and 4, children will learn to add fractions. These fractions will have the same denominator. Children will add the numerator (number of parts) but the denominator stays the same (as the size of the parts are not changing).



Year 3 and Year 4

Subtraction

On entry into Phase 2, children would quickly progress to the column subtraction method – decomposition - which continues throughout the rest of their time here at school. Early introductions to the method would ensure that there was no borrowing or carrying needed to gain experience of the method before introducing the full method: Like column addition, operations are set out into in place value columns.



Subtractions starting on the right hand side.

2 minus 7

If subtractions are not possible without creating a negative number children can 'borrow' from the columns to the right.

2-7 =would create a negative number.

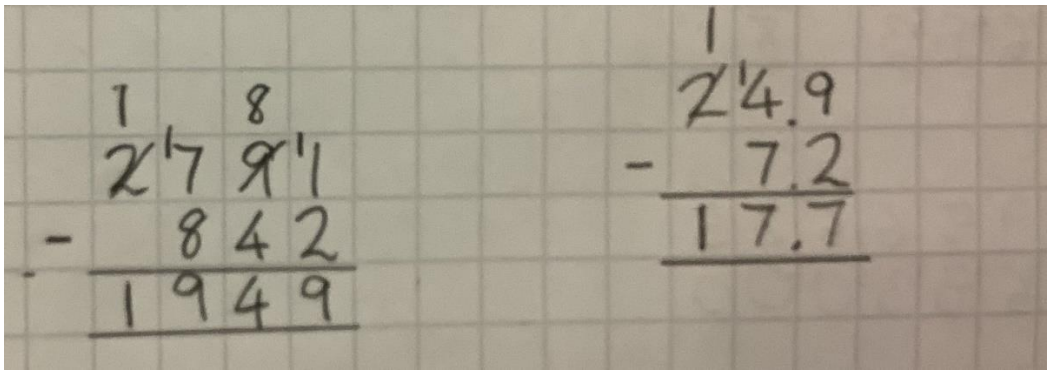
10 is borrowed from the column on the left creating 12 – 7 = 5

If a number is borrowed that column reduces by the value of 1

Digit 9 now becomes 8.

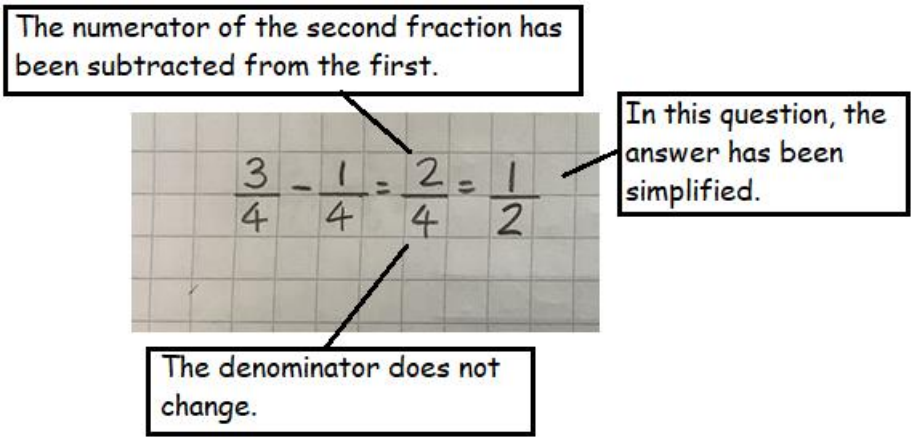
Extension and Progression

Once children have consolidated the formal written method of decomposition, they will be extended through number of digits and decimal numbers.



Fractions

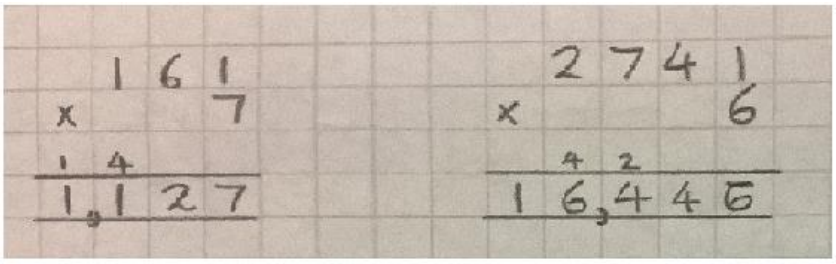
In year 3 and 4, children will learn to subtract fractions. These fractions will have the same denominator. Children will subtract the numerator (number of parts) but the denominator stays the same (as the size of the parts are not changing).



Year 3 and Year 4

Multiplication

Throughout years 3 and 4, children will refine their understanding of multiplication through the formal written method of short of multiplication.



Children need to understand the carrying forward of products that give a 2 digit answer.

6 x 4 = 24

The 2 carries forward to the next column and is added to the next answer

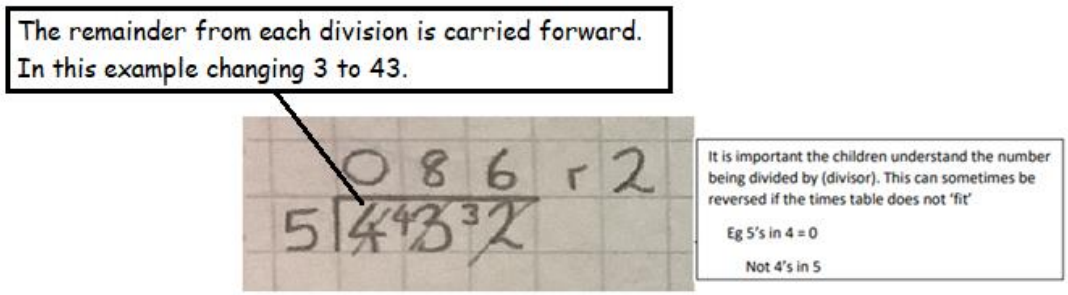
Extension and Progression

To further challenge the children, they can begin to look at more digits (up to 3 and 4 digit) or decimals numbers.

Year 3 and Year 4

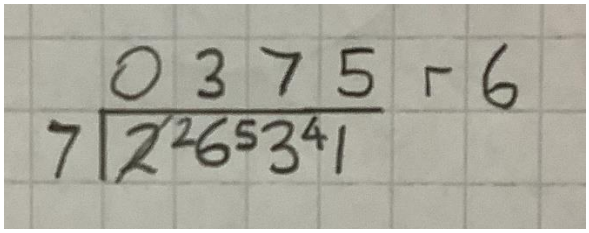
Division

As the children enter year 3, they will be introduced to the short method of division (bus stop method).



Extension and Progression

Once the children have consolidated short division they can be extended by looking at divisors with more digits.

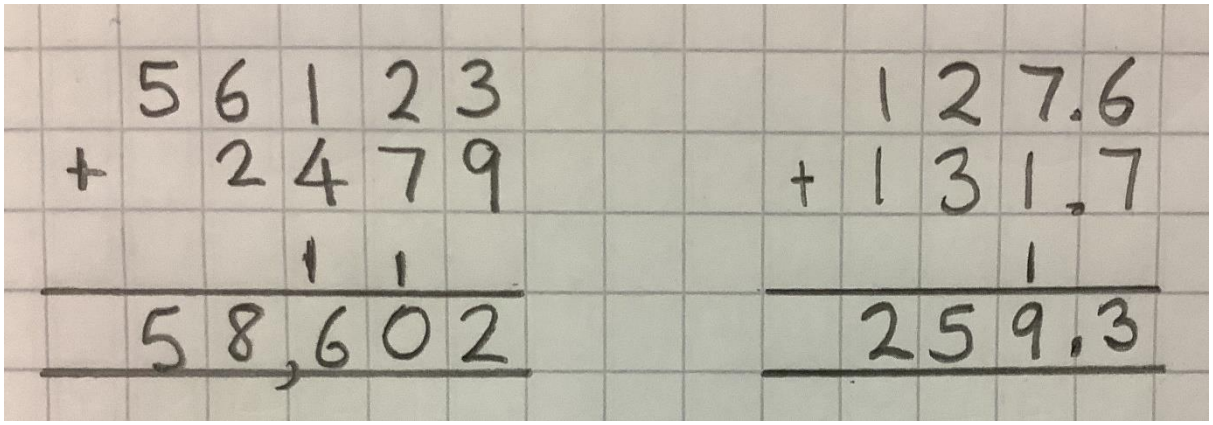


Y5 and Y6

Year 5 and Year 6

Addition

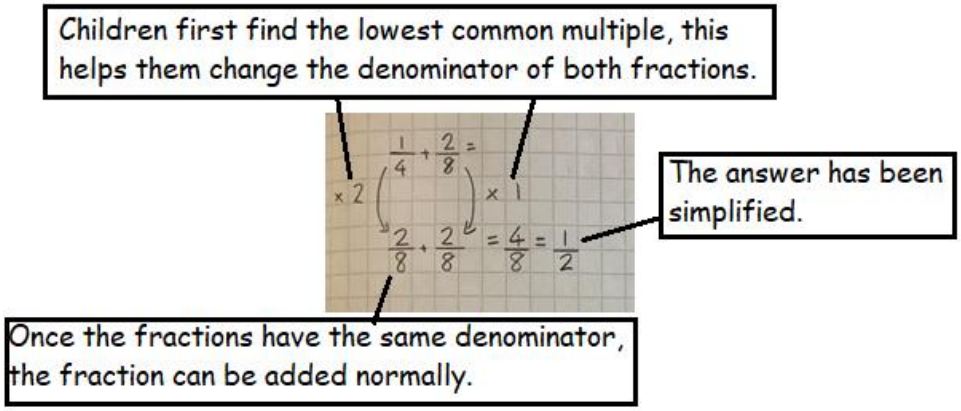
In year 5 and year 6 children consolidate their learning on the previous method of column addition. The steps are still the same, the children must however take more care with their place value (ensuring the 10s from the first number is above the 10s from the second number). This includes decimal places and adding multiple numbers with more than 4 digits.



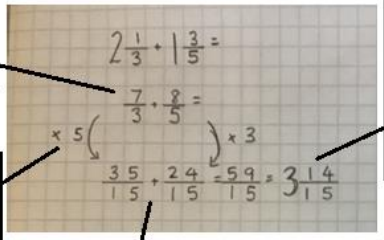
Fractions

In year 5 and 6, children learn to add fractions with different denominators and mixed number fractions.

When we are adding fractions, they need to have the same denominator, this adds another step to the problem. The reason is due to the definition of the fraction itself, which is a representation of parts of a total which must be the same size. When you add or subtract fractions, you can't express the result as a fraction if you do not do this.



For mixed numbers, first children convert the mixed numbers to improper fractions. (Multiply the whole number by the denominator and then add this to the numberator.



If the answer is an improper fraction, it is converted back into a mixed number (divide the numberator by the denominator).

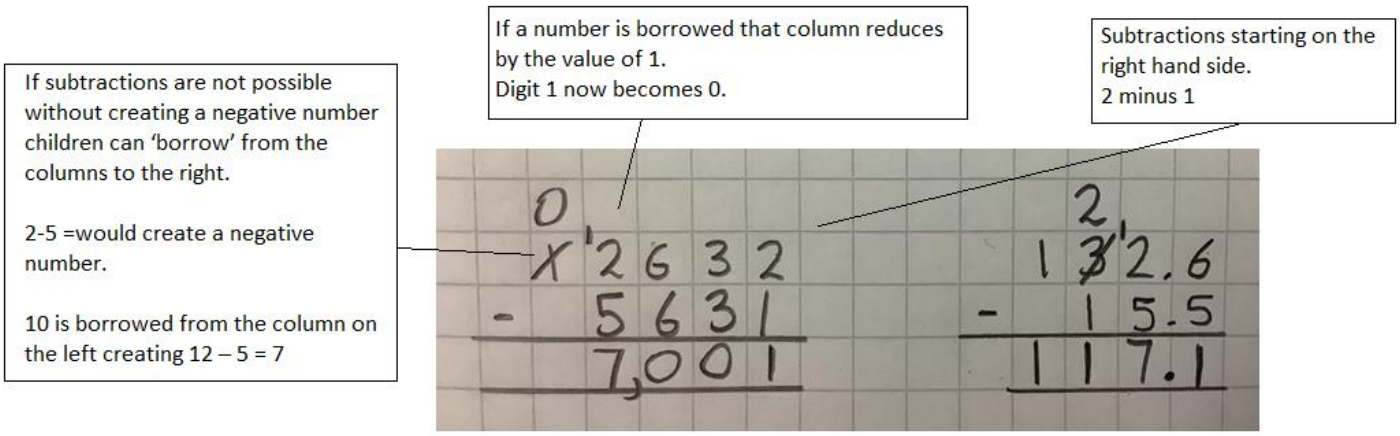
Then, children look for the lowest common multiple of the denominators to convert the fractions.

Children can now add the fractions.

Year 5 and Year 6

Subtraction

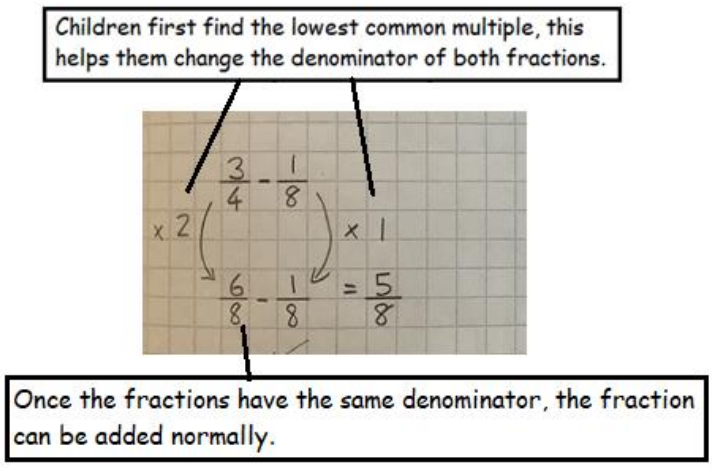
Similar to addition, in subtraction children consolidate their learning of the column subtraction method. This includes decimal numbers and adding multiple numbers with more than 4 digits.



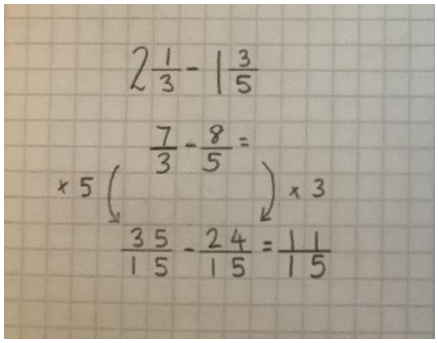
Fractions

In year 5 and 6, children learn to subtract fractions with different denominators and mixed number fractions.

When we are adding and subtracting fractions, they need to have the same denominator, this adds another step to the problem. The reason is due to the definition of the fraction itself, which is a representation of parts of a total which must be the same size. When you add or subtract fractions, you can't express the result as a fraction if you do not do this.



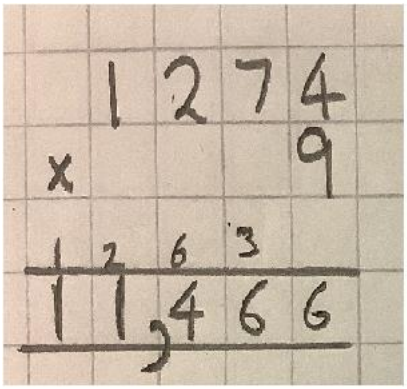
If subtracting mixed numbers. First, both numbers must be converted from mixed numbers to improper fractions. Then the same steps are followed.



Year 5 and Year 6

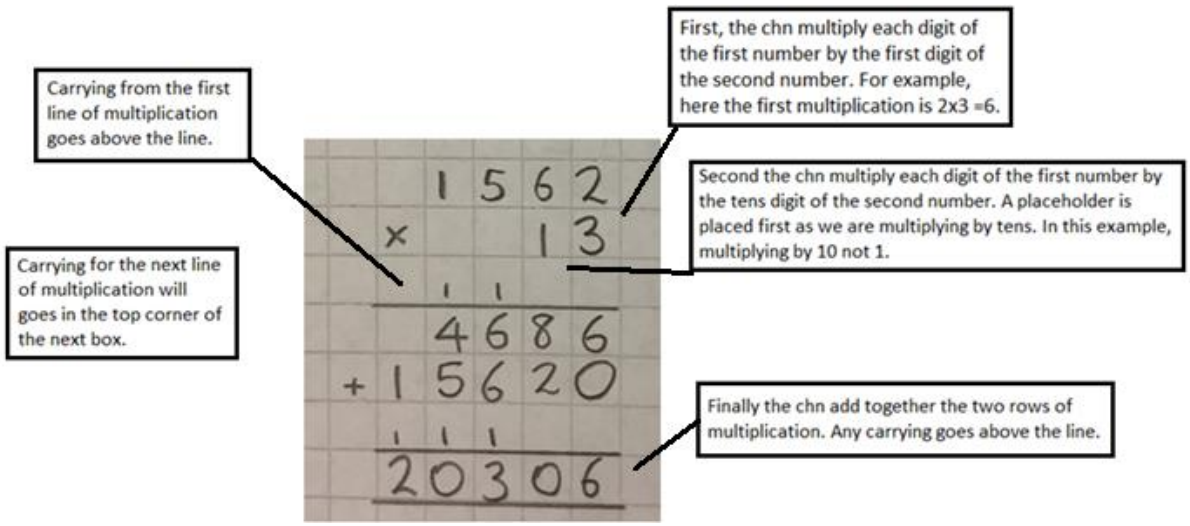
Multiplication

Children continue to use short multiplication when multiplying by 1-digit numbers. Where decimals are concerned, the children are taught to remove them, complete the calculation, then return the decimal to the answer by counting all the decimal places in the calculation.



If this was 127.4 x 9, the calculation would be performed the same way, then the 1 decimal places (from the .4) would be added back into the answer, making it 1146.6

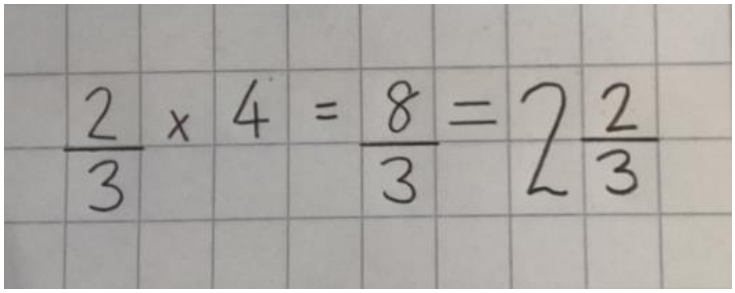
In Year 6, children are then extended to multiply multi-digit numbers up to 4 digits by a 2-digit number using the formal written method of long multiplication.



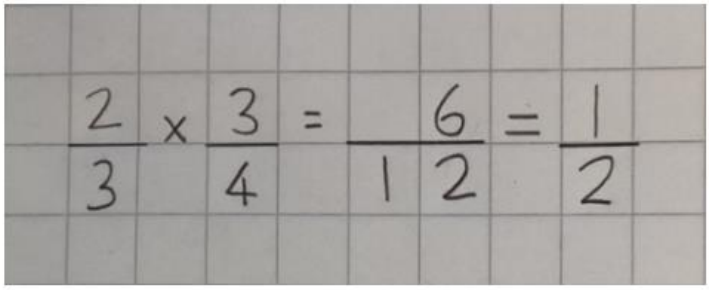
Fractions

In year 5 and 6, children learn to multiply fractions (by a whole number and another fraction).

When multiplying a fraction by a whole number, we multiply the numerator (the number of parts we have) by the whole number. If necessary, simplify the fraction.



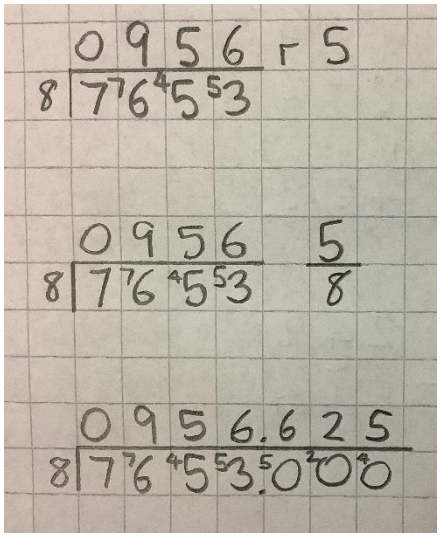
When multiplying a fraction by another fraction, we multiply the numerator of both fractions together and then the denominator of both fractions together. If necessary, simplify the fraction by dividing by the higher common factor (in this example 6).



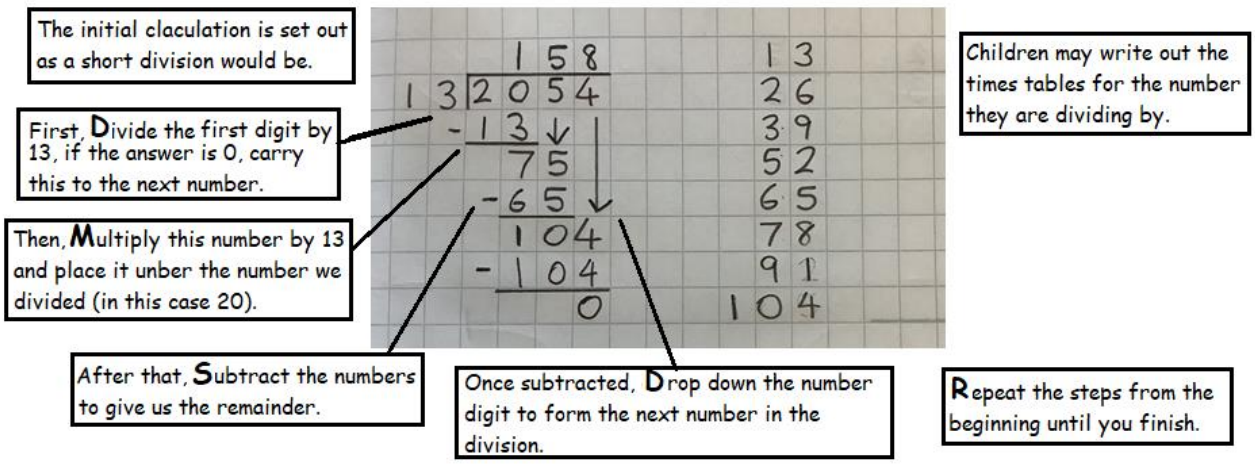
Year 5 and Year 6

Division

Children continue to use short division when dividing by 1-digit numbers. They are also expected to interpret remainders appropriately for the context.



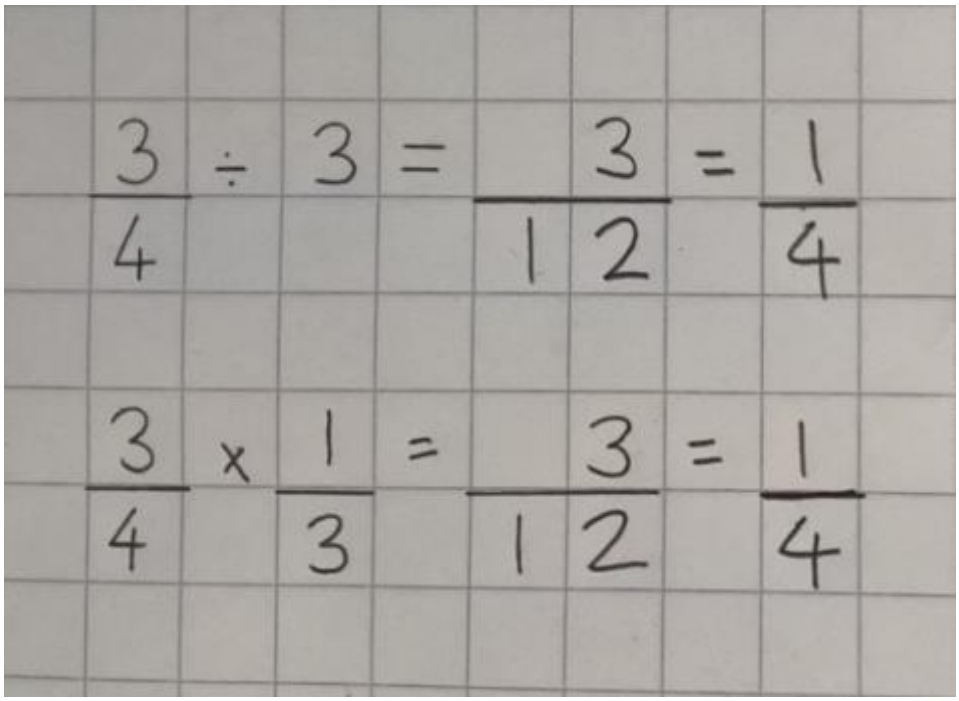
In Year 6, children are then extended to divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders appropriately for the context. Following the steps **D**ivide, **M**ultiply, **S**ubtract, **D**rop Down, **R**epeat will solve this problem.



Fractions

In year 5 and 6, children learn to divide fractions (by a whole number). To help them do this, we use KFC (not the chicken).

We look at the division we are given. First, we **k**eep the first fraction the same. Then, we **f**lip the second fraction (swap over the numerator and denominator). Finally. We **C**hange the division sign to a multiplication sign.



All Calculations

Tips and tricks

When completing long division questions, always go to the 10^{th} multiple of the divisor.