

Vernon Primary School



Calculation Policy

Rationale and Aims

This policy has been put in place to ensure that all children have the same experience in their learning of calculations across the school. Children should have the opportunity to explore the different methods at a time in their learning suitable to them. All members of staff will follow the progression in calculations to maintain a consistent approach across Mathematics teaching. This will enable all children to progress well and build upon their confidence in calculating to become successful Mathematicians.

This policy breaks down the progression for the four operations addition, subtraction, multiplication and division. These are flexible in when they should be introduced. Teaching should be pitched at a level appropriate to the individual class and child. This means that in some instances it will be required for Teachers to look further on for next steps and equally to consider previous stages to ensure that each child makes progress.

The Maths Curriculum emphasises the need for formal methods of calculation. At Vernon Primary, we believe that children should be introduced to this when they are ready and have a secure understanding of number. It is of primary importance that the children achieve the correct answer using a method they fully comprehend, rather than taking steps in a process with no understanding. The CPA approach (concrete-pictorial-abstract) is one that is widely recognised as supporting children in developing a deep and sustainable understanding of Mathematics. This is something we promote at Vernon Primary in supporting children in learning new concepts.

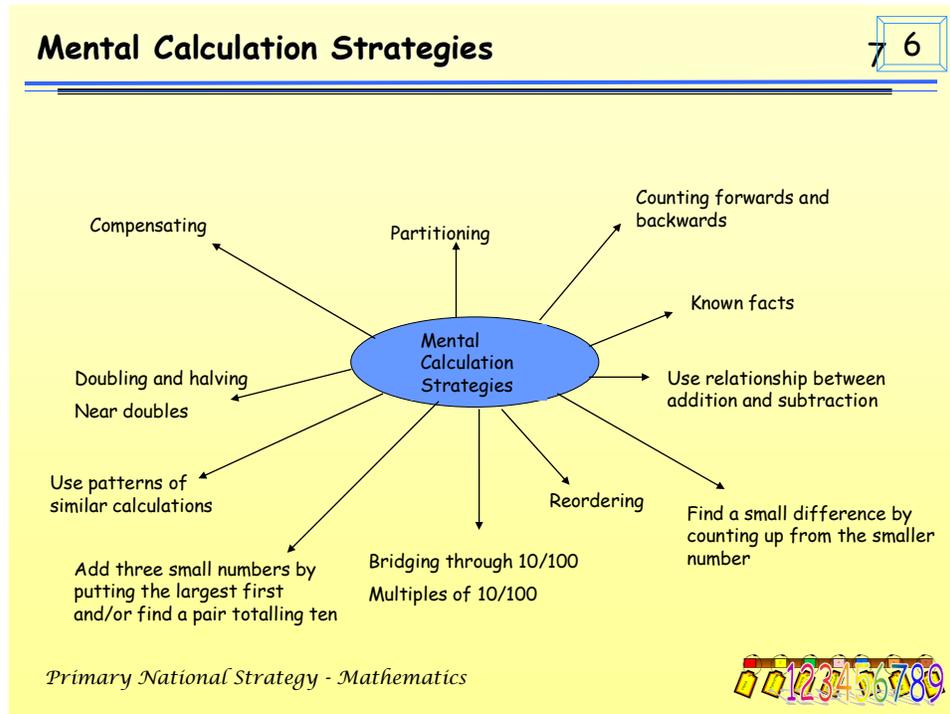
What is a written calculation?

A written method can be thought of as a structured annotation of a calculation, distinct from an informal jotting which nobody needs to see. A useful written method is one that helps children to carry out a calculation and that can be understood by others.

When do written calculations begin?

Children should begin to record their calculations from when they begin reception. This does not mean that it has to be a formal recording. Pictures are included as a means to support a calculation. As they move through school this becomes more formal. They begin to make useful jottings to support their calculations and from Year Four onwards they should be using formal methods. This will not be true for all children as some will develop at a faster or slower rate than others.

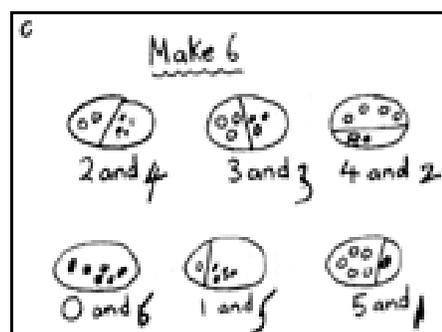
Alongside the written calculations it is important that all children continue to develop their mental calculation strategies.



Addition and Subtraction

In Reception many of the experiences for addition and subtraction will involve practical work. Activities will be put into context of the focus for the week and wherever possible child initiated activities will be provided. Most of the learning will be through first hand experiences and through play. They may record some calculations in a pictorial form and talk about it using mathematical language. Although they may not be recording formally their vocabulary of 'taking away' and combining two groups should be developing through adult led and child initiated activities. Towards the end of the year for those children who are ready, more formal experiences of calculating e.g. number stories or sentences will be taught. The children will be introduced to number lines and number tracks in their work on number recognition.

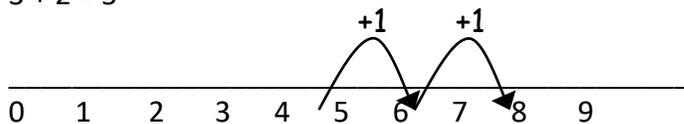
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures. For example:



Other models and images are introduced as they learn to add and subtract such as the bar model and the part-whole model to ensure that they have a thorough understanding of the concepts. This can be introduced when the children have had sufficient concrete experiences.

They use number lines and practical resources, such as multilink, bead strings and compare bears to support calculation. Children then begin to use numbered lines to support their own calculations to count on in ones. This use should be carefully modelled so they understand that they count how many jumps on or back and not the numbers themselves.

$$3 + 2 = 5$$



Children should experience using a number line to help them to understand that addition can be done in any order but subtraction must have the largest number first. It should be used to support bridging through ten, adding a near multiple of ten and adjusting, near doubles and other strategies.

Following confident use of a number line they should then move on to using and understanding a hundred square.

Once they are confident with a numbered line, calculations can be moved on to an empty number line relying on them to write in the numbers and show a deeper understanding of the number system.

Alongside the empty number line the partitioning of numbers to add and subtract is a powerful tool. It is important that the children learn to add on or subtract the ones first as this is how they will calculate when they come to use the formal written methods.

$63 + 38$	$87 - 39$
$63 + 8 = 71$	$87 - 9 = 78$
$71 + 30 = 101$	$78 - 30 = 48$

In addition to this place value cards should be used to aid with partitioning. The Diennes equipment also provides a visual aid to support these calculations. When confident with this, children can then go on to work with 3 digit numbers, crossing over one hundred boundaries.

After having accomplished this technique, the next step is the expanded method without decomposition. The children should be reminded to always work with the ones first. The next step is to use the expanded method with decomposition. The final step is the compact method.

$342 + 146$ 300 and 40 and 2 + <u>100 and 40 and 6</u> <u>400 and 80 and 8</u>	$342 +$ <u>146</u> <u>488</u>	$267 + 145$ 200 and 60 and 7 + <u>100 and 40 and 5</u> <u>400 and 10 and 2</u> 100 10	$267 +$ <u>145</u> <u>412</u> 1 1
$687 - 342$ 600 and 80 and 7 - <u>300 and 40 and 2</u> <u>300 and 40 and 5</u>	$687 -$ <u>342</u> <u>345</u>	$245 - 187$ $\begin{array}{r} 100 \quad 130 \quad 10 \\ 200 \text{ and } 40 \text{ and } 5 - \\ \hline 100 \text{ and } 80 \text{ and } 7 \\ \hline 0 \text{ and } 50 \text{ and } 8 \end{array}$	$\begin{array}{r} 1 \quad 13 \quad 1 \\ 245 - \\ \hline 187 \\ \hline 58 \end{array}$

Whenever a new concept is introduced e.g. decimals or larger numbers it may be necessary to take a step back in the methods until the children feel confident with the calculation and can move on again.

Under the Mathematics Curriculum, there is a push towards children recording formally at an earlier age. We believe it is paramount that children begin to record formally only when their understanding is at a level that will enable them to do this successfully.

Children should also be taught when it is appropriate to carry out a formal calculation and when it would be quicker to carry out a mental calculation.

Multiplication and Division

Multiplication

Although no formal recording of either of these operations will take place in Reception they will begin to lay the foundations. This is particularly true for division as sharing. Children will experience many occasions when they have to share out objects between groups and this begins work on division. As early as possible, division should be referred to as 'shared equally between' to avoid confusion later on in their education. Children may begin to count in 2s when counting e.g. shoes or socks and this lays foundations for multiplication.

When first introduced, multiplication is discussed as groups of or lots of. The relevant vocabulary should be shared and referred to throughout the teaching of this concept. As well as drawing 'groups of', the children should draw arrays as this provides the foundations of the grid method of multiplication. It also provides a basis for finding the area of a shape and as a result is an important foundation.

Below is the grid method.

X	20	4
10	200	40
6	120	24

This can then be used for larger numbers and to include decimals.

The national expectation is that children should know their 12 x 12 tables by the end of Year Four. Before learning their tables, it is important that children understand what 'x' represents in Mathematics. We need to provide many opportunities for children to learn their tables and practise the skills.

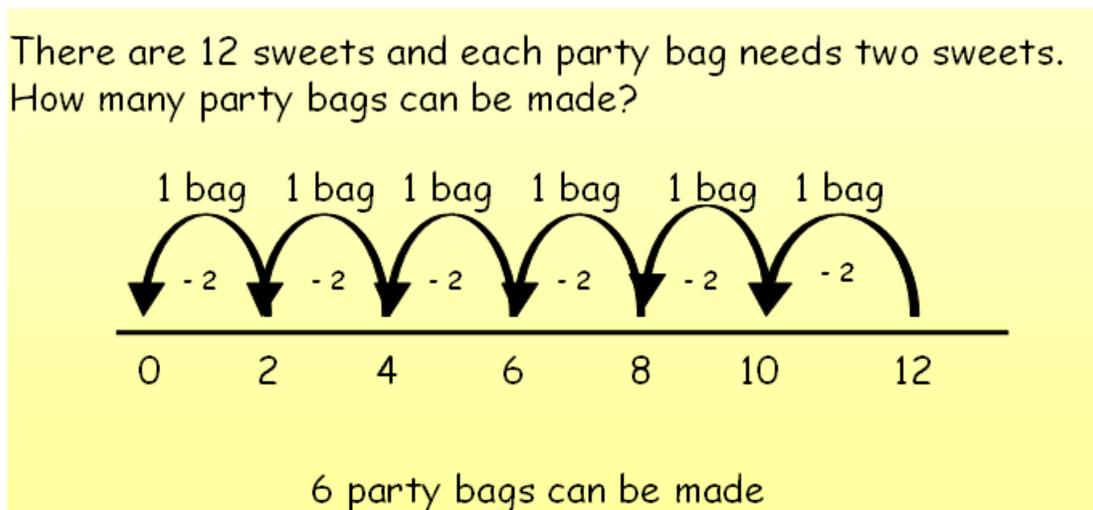
Division

Division begins naturally with sharing before children even begin school life. Their experiences may be mixed and can lead to misconceptions. Sometimes their experience of sharing may not have meant equal parts. This concept is key in division.

When division is first introduced it is important that children are exposed to different representations with equal importance placed on each one. Grouping into, sharing and repeated subtraction should be demonstrated and introduced to all children. It is then the child's decision which method to adopt. Different situations will require them to respond in different ways. For example $12 \div 3$ could be seen as there are 12 sweets to be shared between 3 children, or there are 12 sweets and there needs to be 3 in each party bag. Both situations require division but one requires sharing whilst the other requires grouping. We need to equip our children with the tools to tackle any situation.

The symbol is shown to the children and related vocabulary explained. Lots of practical work follows and again drawing pictures can aid their methods.

Below is an example of how children may divide on a number line.

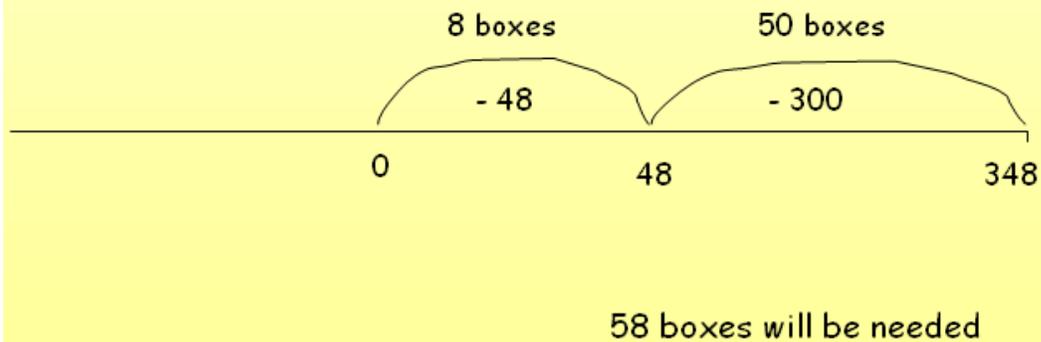


When confident with this, children then move onto working with larger numbers and chunking. In order to be successful with chunking they must show confidence in multiplication. This can begin on a number line.

The hens have laid 348 eggs.

Eggs are packed into boxes of 6.

How many boxes will be needed?



They will then move on to a more formal method

$$63 \div 4 = 15 \text{ r } 3$$
$$\begin{array}{r} 4 \overline{) 63} \\ \underline{40} \\ 23 \\ \underline{20} \\ 3 \end{array}$$

10 x 4

5 x 4

When totally confident the children may be introduced to using 'the bus stop' method. Here they must have a very secure knowledge of place value to understand what they are doing.

This policy shows the main methods that all children in our school should experience and be confident with.

Monitoring and Review:

We are aware of the need to regularly review our policies to take into account the new initiatives, changes in curriculum or developments in technology.

Julie Evans

Subject Leader for Mathematics

Policy date – November 2020

Review Date – November 2022

Ratified by Governors – November 2020