Developing fluency by Mastering Number Sense in Year 1

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Aims of project

Through this project I have been looking to improve pupils' understanding of what numbers represent and the relationships between numbers in order to allow pupils to begin to develop true fluency in their maths learning. In turn, this allows pupils to understand and use number facts effectively, rather than simply memorising them in an arbitrary way that does not have an impact on their learning.

To achieve this I firmly believe that children needed to have mastered place value. To ensure that children are able to develop a deep understanding of place value it is vital that the are exposed to a wide range of models and images to represent 2 digit numbers, clearly demonstrating the value of each digit and its relative size to other numbers overall. It is also essential that children develop a sense of the flexibility and fluidity of numbers through understanding fact families and partitioning of numbers.

Allowing time for mastery

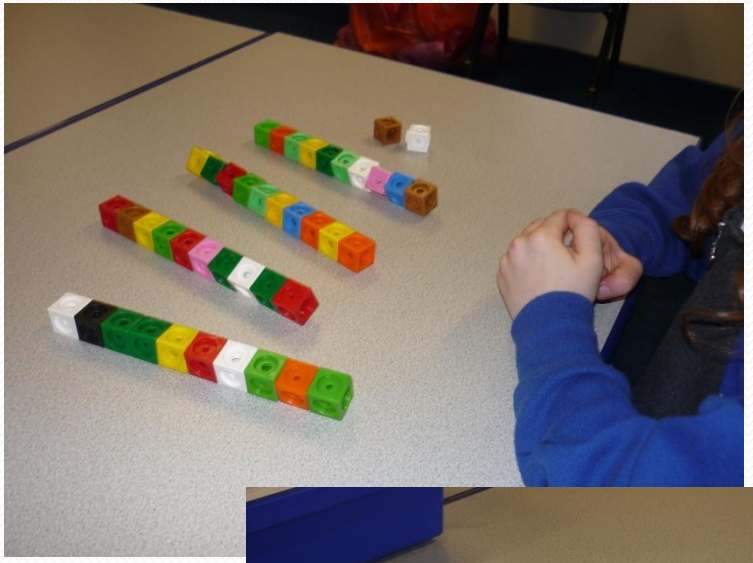
One of the key principles that has allowed this project to be successful has been ensuring children are given enough time to cover things in sufficient depth. This has meant that pupils can develop a proper understanding of what they are doing, being given time to explore the various models and images and then use and apply them independently to solve problems in a more abstract way and make connections to other areas of their maths learning. For example, we spent three weeks purely on place value in 2 digit numbers before moving on to spend an entire half term on addition and subtraction. We have found that children a able to master each concept much more effectively and in greater depth, seeing the links between each area.

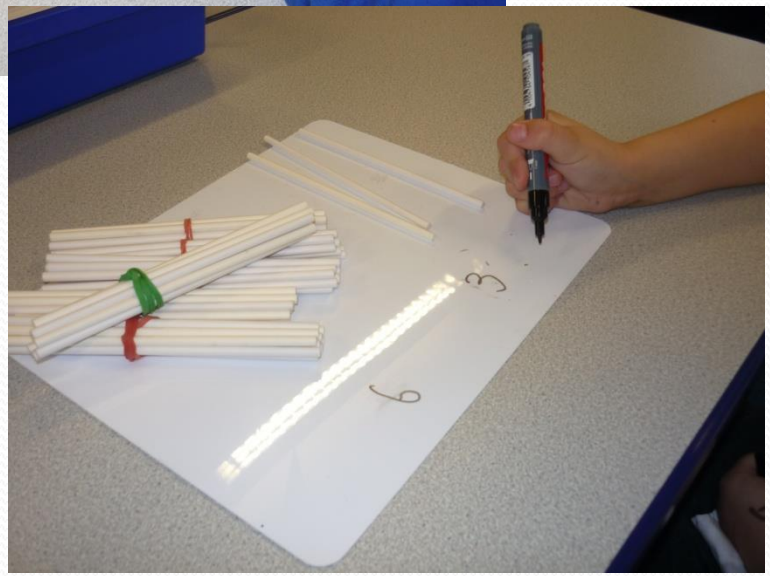
Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Place Value Find PV of each digit	**Place Value** Find PV of each digit Use PV to answer questions	**Add/Sub** Add and subtract 1 & 2 digit numbers	**Add/Sub** Add and subtract 2 digit numbers	**Add/Sub** Add and subtract 2 & 3 digit numbers Solve problems	**Add/Sub** Equals sign meaning the same (not answer) > & <	**Add/Sub** Use facts to work out similar facts to 100	**Add/Sub** Add and subtract 2 & 3 digit numbers **+ mentally to 20**

Place Value

At Priory Rise we believe it is essential for pupils to develop a solid understanding of place value at an early age.

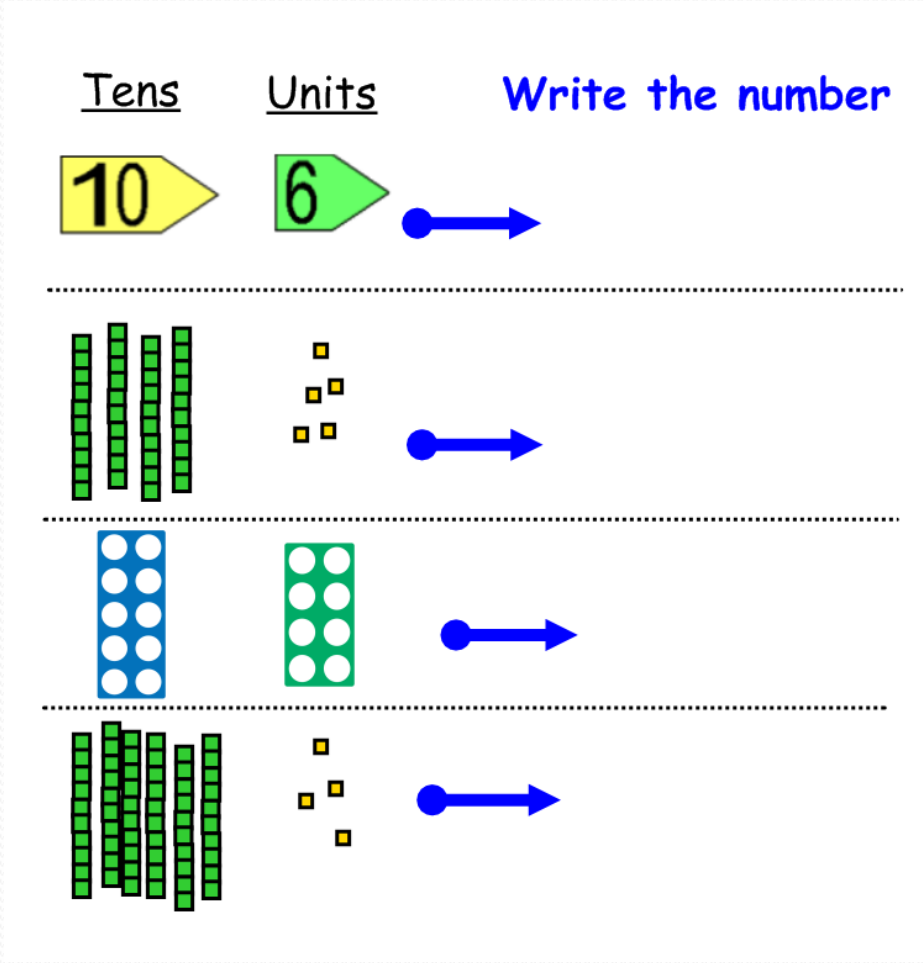
Using physical representations alongside a wide range of models and images as part of this project, we have been ensuring children develop their number sense and fluency. Ensuring children use a wide range of visual models - including multilink, straw bundles, ‘Numicon’ and ‘Base Ten’- has meant that pupils are able to visualise numbers clearly, understanding the relationships between each digit and how numbers can be manipulated.





To begin with, pupils identify place value in 2 digit numbers by identifying groups of 10 and recording the value of each digit of the number.

Place Value



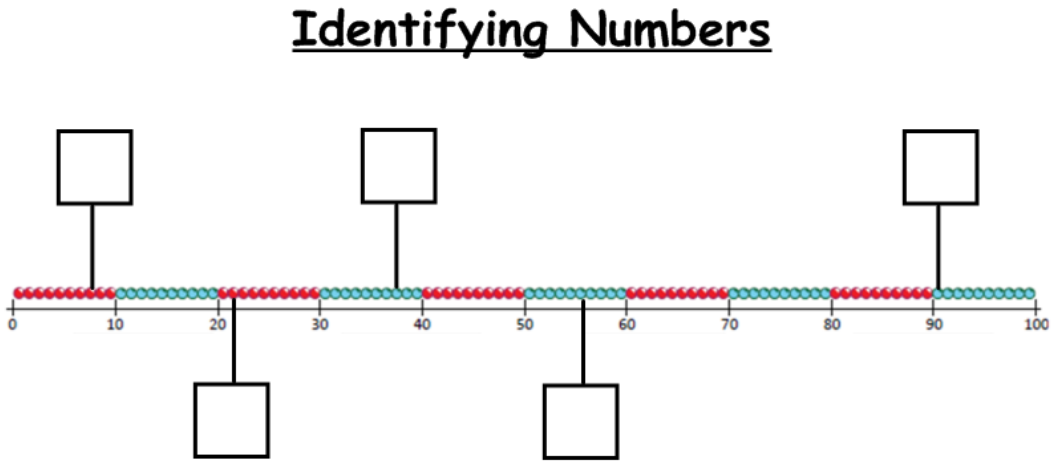
We have found that pupils were quickly able to identify 2 digit numbers once they were secure in their understanding of the value of each digit.

Activities such as this are used as quick starters to maths lessons.

Place Value

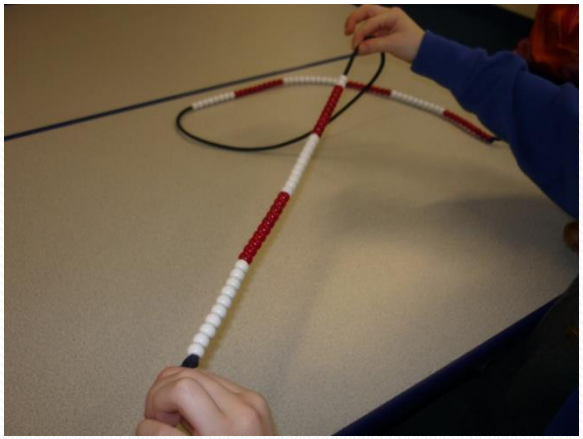
We have also found that it is important for pupils to use bead strings and other linear representations of larger numbers, as this allows children to fully comprehend physical size of the number as its 'length' is always directly comparable (equipment such as Base Ten can be spaced out wider to make numbers appear bigger whereas numbers on a bead string are always consistent) .

Pupils are able to directly apply their knowledge of place value to identifying 2 digit numbers on a bead string and are confidently counting in tens then ones to find the numbers.



Also mark these numbers on the number line...

13, 46, 62, 85

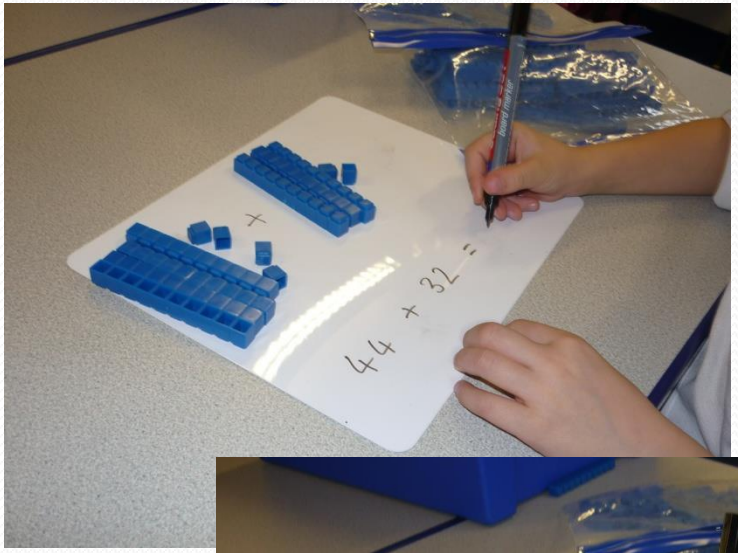


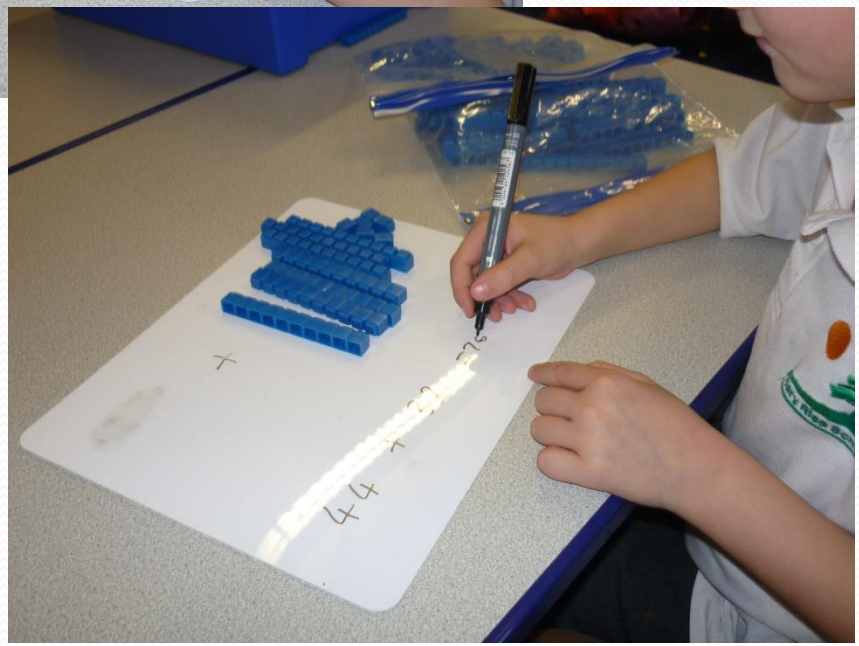
Pupils are able to reason effectively e.g. In this example the pupil explained: " I know it's 42 because I have 4 groups of ten then 2 more to make 42".

Applying Place Value

We were happily surprised with how quickly pupils were able to apply their knowledge of place value to addition and subtraction. Because they were so secure with their understanding of the numbers, pupils can confidently manipulate and partition them to solve simple problems. Higher achieving children have even been independently “exchanging” units for tens when crossing the tens boundary.

This has of course only been possible due to the constant support of models and images alongside all calculations, in addition to ensuring children explain in full what they are doing as they solve problems.

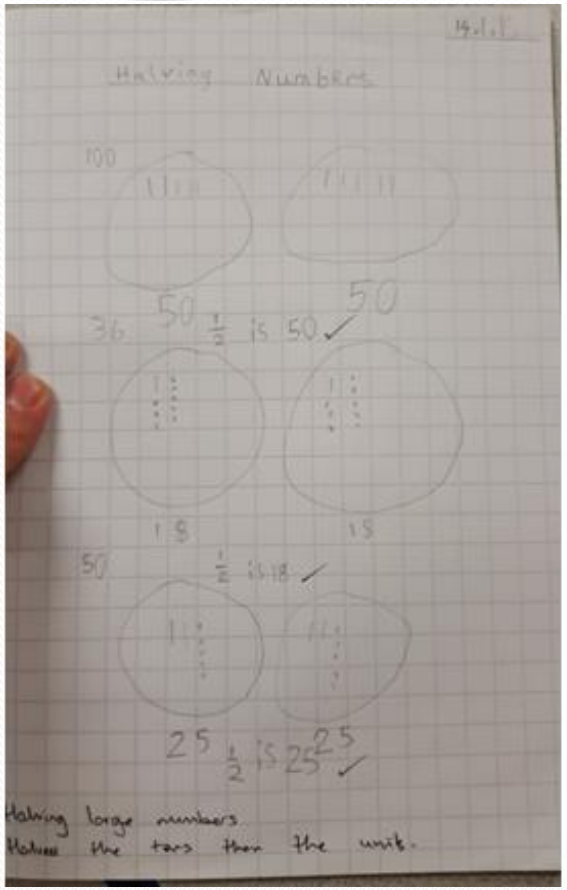


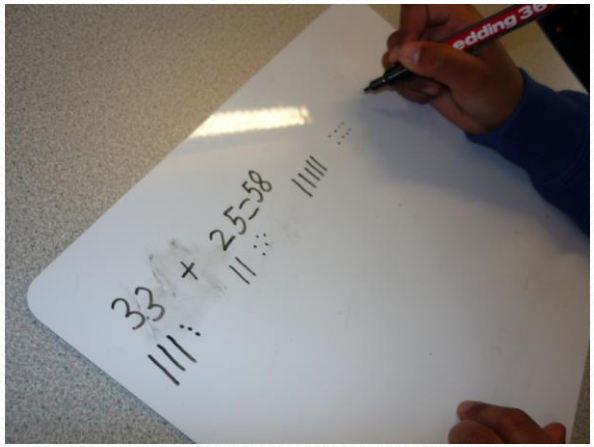


Applying Place Value

Being so familiar with visual representations has now lead the children to be able visualise numbers in terms of tens and units/ones.

Alongside using the physical representations we have been modelling using jottings as tens and ones to record numbers and solve problems; most children are now confidently using this a method to represent numbers and to add and subtract – preparing them well for the new Year 2 assessments. By recording numbers in this way pupils are demonstrating that they understand the full value of each number and do not lose the sense of scale when adding/subtracting larger numbers.



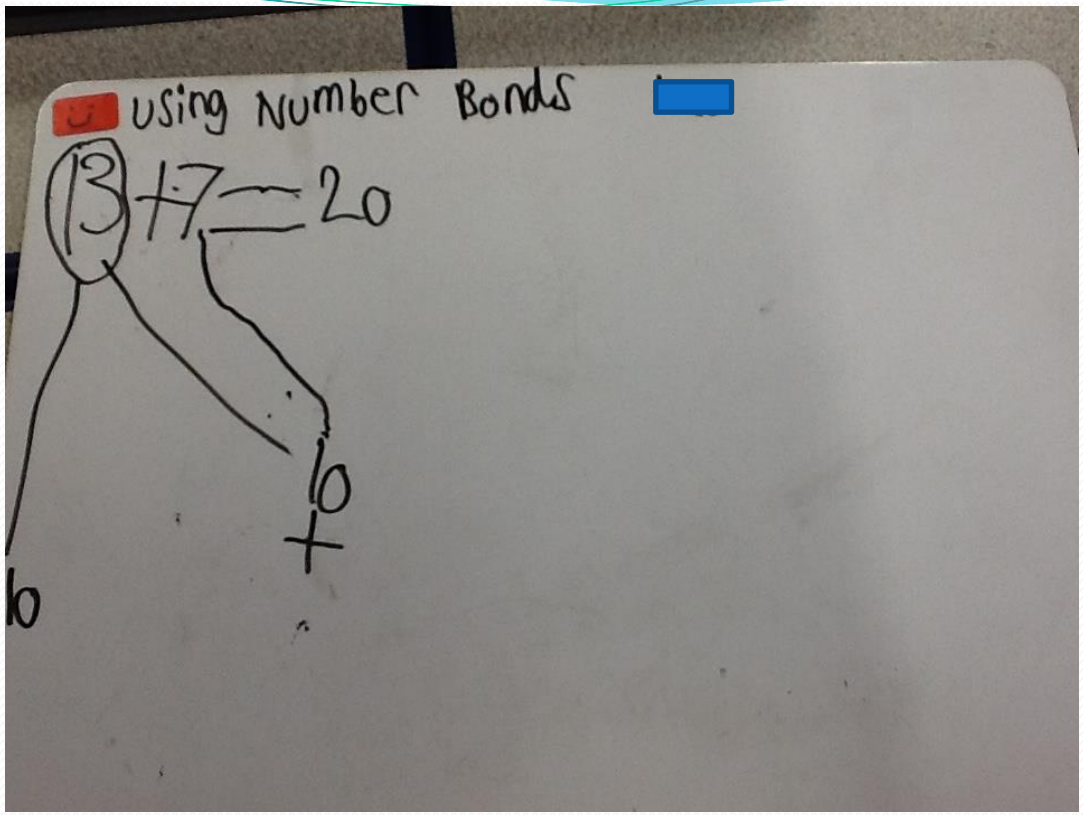


Pupils are now able to use jottings representing tens and units to solve problems without physical apparatus.

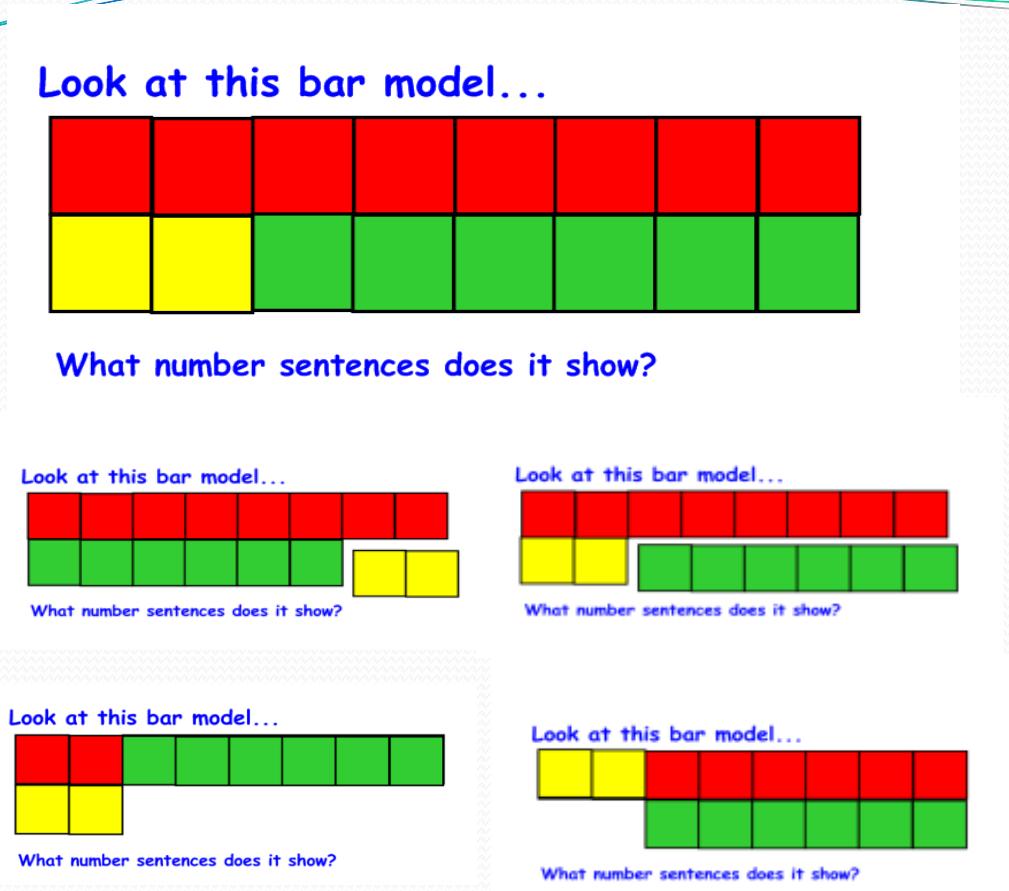
Applying Place Value

Having a strong understanding of place value also means pupils are able to think in a fluid way about solving problems. Pupils are confidently using partitioning and recognising ways to make 10 as a direct result of making groups of 10.

Higher achieving children are beginning to understand how we can “bridge ten” by partitioning numbers into smaller numbers (not just tens and units).



In this example a lower achieving pupil has been able to use his understanding of partitioning and place value to identify a number bond to 10 and solve the problem independently .



Each bar can be moved as a complete block on the interactive white bored to show equivalence and how each number related to the other.

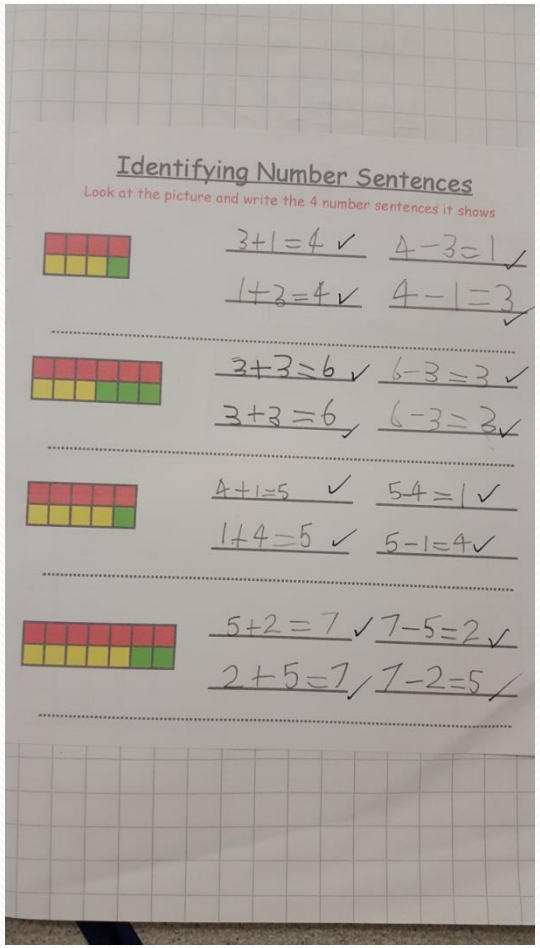
Fact Families

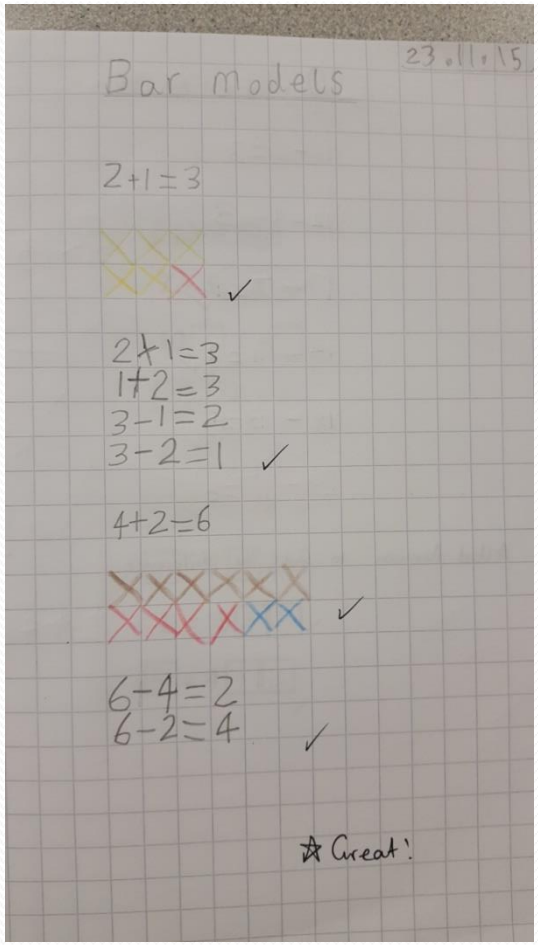
Developing a good understanding of fact families is an excellent way ensuring children are developing good number sense. Whilst children do not need to necessarily need to do any direct calculation when identifying fact families, from given numbers, they do need to fully understand how the numbers relate to one another in order to identify the possibilities.

Again to ensure children understand how each number in a fact family relates to one another it is crucial to use strong visual representations , such as the bar model, showing how the number sentences are formed.

Fact Families

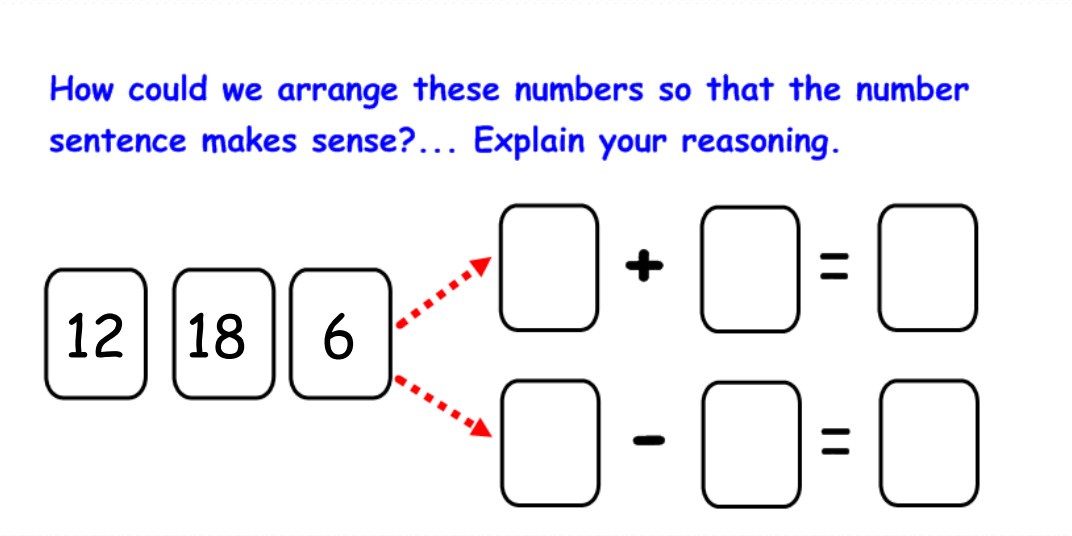
Children are confident in identifying the fact families shown in the models and images, even creating their own to demonstrate a deeper understanding of the concept.



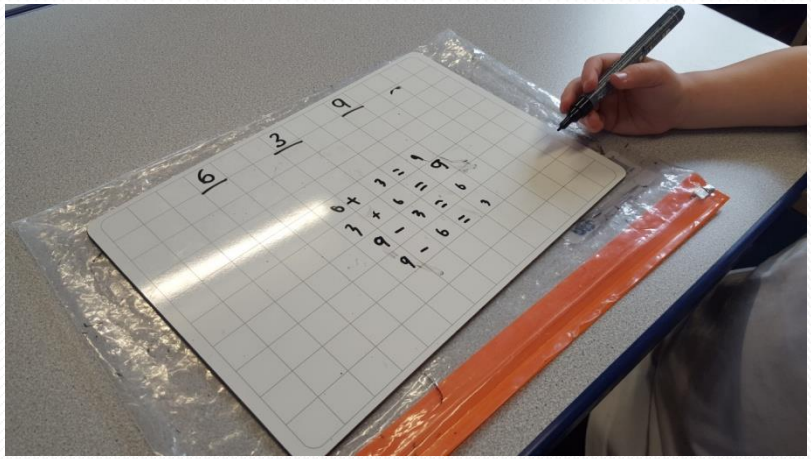


Fact Families

Through Fact Families children demonstrate their understanding of addition and subtraction, using their reasoning skills to justify their answers e.g. “I know that when we’re adding the number will get bigger, so the 2 smaller numbers must go together”.



It has also been very good for supporting children to use number facts in their learning, as they are able to explain what else they know once they have identified one number sentence.



This has mean that children are much more fluent with their calculations, and have been able to focus on reasoning rather than simple calculation in order to access more complex learning.

Summary

- As a direct result of this project we have seen a big improvement in pupils' number sense across Year 1 compared to last year.
- Children are able to think about and visual numbers more successfully and fully understand symbolic representations due to having a secure foundation in clear models and images of those symbolic representations.
- Pupils are more fluent with their number facts because they understand what each number 'means' and can confidently use their reasoning skills to explain what they are doing at each stage of a problem.
- A big factor in the success of this project has been the longer time spent on each area, in addition to ensuring everything we do is backed up by physical and visual representations to support the abstract concepts later.