



Fluency with Number

What do the children need to know and why?

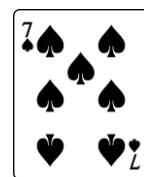
We are regularly approached by parents, seeking advice on ways they can support their child at home with maths. Answering this question can be difficult as this subject is made up of many different topic areas and children will have varying degrees of understanding in each one.

However, learning maths is like building a tower; children must have firm foundations and acquire specific building blocks in a certain order. If any of these blocks of understanding are missing, then the tower is shaky and can be toppled with the presentation of new challenges or concepts later down the line. The most important job that parents can do at home, therefore, is to make sure that these basic building blocks are secure.

The purpose of this document is to explain what these basic skills are – to make clear the steps which children progress through as they develop an early understanding of number. If parents understand this progression for themselves, then they are better placed to identify any gaps in their child's learning and, more importantly, will know what to do to fill them.

Developing a conceptual understanding of number:

A key priority of any primary school teacher is to ensure that children develop a strong sense of number and place value. Children will continually encounter numbers in the world around them, whether it be on the bus they took to school or on their front door at home. But the ability to recognise the symbol 5 and name it, is very different from understanding the 'fiveness' of it (i.e. that it represents 5 things). It is the development of this latter skill that is crucial to a child's mathematical ability.



Furthermore, it is important to recognise that just because a child can count (i.e. recite number names in order), they do not necessarily have any understanding of what these words mean. As with learning the alphabet or a favourite nursery rhyme, children can recall a sequence of numbers or words by rote, without any real grasp or understanding of what they are saying (hence why young children often omit numbers as they count). Gaining familiarity with number names through songs and rhymes is of course helpful, but emphasis should be placed on enabling children to make links between these symbols, their names and the number of objects they equate to.

If, for instance, I presented you, as an adult, with the calculation below, my guess would be that you couldn't do it:



You might be able to say it as a sentence, 'apple plus bee', but without an appropriate conceptual understanding of these symbols, any effort to solve the equation would be futile. This is no different from asking a child, who has not yet linked the abstract numerals (e.g. 4, 0, 2 etc) in our number system with anything tangible (i.e. they don't yet know that 3 relates to 3 things), to add together 4 and 3. It is only once a meaning has been attributed to these symbols (if I told you that 🍏 = 5 and 🐝 = 2, could you do it now?) that children can solve simple arithmetic calculations.

In order for children to cultivate this number sense, various resources (such as counters, multi-link and Numicon) are used to expose their structure, enabling children to develop mental representations of what they look like. Much of a child's early experience with number will involve physical, movable objects which they can manipulate to suit the task in hand. Over time, as a child's conceptual understanding develops, these concrete objects will be replaced with pictures and then simply with mental images. Eventually, children will feel secure enough in their understanding to work wholly in the abstract.



Addition and subtraction facts within 20:

Once children have grasped the concept of number, the focus turns to developing their knowledge of addition and subtraction facts within 20. These serve as the building blocks for additive calculation, in much the same way that times tables provide the foundations for multiplication and division. For instance, when children are presented with calculations, such as $46 + 52 = ?$, they must be able to automatically retrieve the simple arithmetic facts they need in order to solve it fluently and efficiently (in this case, $6 + 2 = 8$, and $4 + 5 = 9$, therefore $40 + 50 = 90$).

If they can't retrieve this knowledge, if instead their working memory is required to calculate these basic facts on the spot, then children can get overloaded with information and become confused, and hence find themselves unable to focus on the 'bigger ideas' in hand. Imagine another example, whereby the purpose of the lesson is on finding change from a specified amount of money, and a child is working on a problem which involves the calculation: $£10.00 - £7.23$. Without a quick recall of key addition and subtraction facts, the child's attention deviates from the intended learning (about change) and instead focuses on calculating simple facts, most likely using inefficient strategies such as counting on their fingers. If, during a lesson, a child is regularly having to digress from the mathematical concept being taught and compute facts that he/she should already know, it is not hard to see how, and why, children end up struggling to take on board new information.

Mental calculation strategies:

An ability to think mathematically is not solely about finding the right answer to a problem; it also involves choosing the most efficient method of doing so. At primary school, a great deal of emphasis is placed on developing children's formal methods of calculation, with children learning how to apply them from Year 3 upwards. As soon as children become familiar with these strategies however, they have a tendency to use them over any other, often forgoing quicker, more suitable mental maths strategies. For example, the formal method of subtraction will certainly help you find the correct answer to $102 - 99$, but a child who recognises that they can quickly find the difference between these two numbers in their head instead (by counting on 3) displays a much higher level of thinking. Therefore, when teaching children calculation strategies, considerable attention is also paid to helping them identify which strategies to use and when.

The documents that follow provide you with ideas of games and activities you can play at home to help you support your child's learning of these key mathematical skills (a secure sense of number, quick recall of number facts, and an ability to select and use the most appropriate mental calculation strategy).