



How to help your child...with number operations

Please also see "How we teach + - x ÷ as your child goes through school."

Many of us remember, from our own school days, the short formal method for, say, column multiplication or column addition. We often remember rules involving ideas like "I need to borrow/ carry/ pay back" although we might not be entirely sure why we need to do this beyond following the rule. Often, we can't remember the stages we went through in our mathematical learning before we were able to get to this point.

At Willerby Carr Lane Primary School, our maths teaching is based on developing a rich understanding of number. We teach children to develop their mathematical fluency without simply resorting to rote learning. We teach children to apply reasoning to solve challenging, non-routine maths problems which go beyond simply applying memorised procedures.

Children are given time to think deeply about the maths and really understand concepts at a relational level rather than as a set of rules or procedures. This leads to greater progress because it ensures that students are secure in their understanding. The emphasis is on promoting multiple methods of solving a problem,

building self-confidence and resilience in pupils.

A key element of our approach to teaching maths is the idea of journeying through Concrete, pictorial, abstract (CPA) representations. CPA is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils. CPA was developed by American psychologist Jerome Bruner. It is an essential technique within the Singapore method of teaching maths for mastery.

Children will travel along the CPA continuum again and again, often revisiting previous stages when a concept is extended. Children use concrete objects to help them make sense of the concept or problem; this could be anything from real or plastic fruit, to straws, counters, cubes or something else meaningful.

Whatever the objects are, they can be moved, grouped and rearranged to illustrate the problem.

As the child's experience and confidence grows, they may no longer need physical objects to actually move around. Instead, they draw them. These simple pictures to represent the problem could be pictures of real objects they have used in the past, objects mentioned in the problem or something else meaningful.

As understanding develops, children move on to use some form of abstract representation. This could be giving values to rectangular bars (bar model) to identify what is known and what is unknown, using a symbol to stand for a number or something else.



It is important to realise that these are not stages gone through once, but a continuum. There will be occasions when a particular child will use concrete, pictorial and abstract representations all in one session. A child who uses abstract representations in one area may need concrete representations in another. On a different occasion, a child may need to revisit a concrete representation before moving on to a pictorial or abstract one. Therefore, it is important that a variety of representations are available for children to use at all times. Sometimes children will need to touch and manipulate, but at other times simply seeing or imagining the representation will be enough.

Using the CPA approach, understanding is likely to be developed more quickly where children are encouraged to start from modelling a problem with concrete objects, before moving on to pictorial and abstract representations. Therefore, a variety of manipulatives are made available in the classroom, and not just for Key Stage 1 children.

So, if you are trying to help your child at home to develop their understanding of number, then take a look at our attached calculation progression document. It illustrates how you can use the CPA approach with each of the four number operations to really develop a firm understanding and not simply rely on a set of 'rules'...

<p>Column method without regrouping</p>	<p>Use Base 10 to make the bigger number then take the smaller number away.</p> <p>Show how you partition numbers to subtract. Again make the larger number first.</p>	<p>Calculations</p> $\begin{array}{r} 54 \\ -22 \\ \hline 32 \end{array}$ <p>Calculations</p> $\begin{array}{r} 176 \\ -64 \\ \hline 112 \end{array}$	<p>Draw the Base 10 or place value counters alongside the written calculation to help to show working.</p> $47 - 24 = 23$ $\begin{array}{r} 40 + 7 \\ -20 + 4 \\ \hline 20 + 3 \end{array}$ <p>This will lead to a clear written column subtraction.</p>
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