

SEND SERVICE 0-25 GUIDES

Supporting access to maths lessons using concrete apparatus and visual resources



Why use concrete apparatus and visual resources?

Using a **CPA** (Concrete, Pictorial, Abstract) approach can help pupils understand and embed abstract mathematical concepts.






In the **Concrete** stage, problems are represented using physical objects. Using a range of different concrete objects can help to deepen understanding. This stage can also be described as the '**doing**' stage. In the **Pictorial** stage, visual representations of the problem are made; this can include pictures, diagrams or models. This stage can also be described as the '**seeing**' stage. In the **Abstract** stage, abstract symbols are used to model and solve maths problems. Pupils will be able to do this more easily if they have first gained an understanding using the concrete and pictorial stages. This stage can also be described as the '**symbolic**' stage.

It is important that pupils are given the chance to go backwards and forwards across these stages. Children with additional needs may need to use concrete resources most of the time. Using a range of concrete apparatus and visual resources will help to develop flexible thinking, making connections and deepening understanding; over time pupils may be able to self-select the most relevant resource.

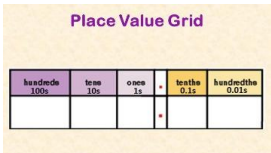
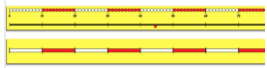
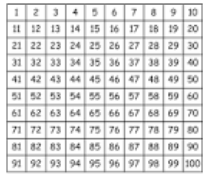

Examples of resources to support the CPA approach

Resource	What does it look like?	How does it help?
Counting bears		The bears are designed to support the development of early maths skills. They can be used to introduce basic maths concepts such as addition, subtraction, counting and estimation . The different colours, weights and sizes also make them useful for practicing sequencing, sorting and grouping .
Multilink		Multilink can be used to support the development of all the concepts above. Making a linked tower of Multilink and breaking it apart in different ways provides a multi-sensory, practical way of exploring number bonds . In addition, the fact that the cubes link offers the chance to use them in measurement and graphing activities, as well as exploring the concept of volume .

SEND SERVICE 0-25 GUIDES

Numicon®		<p>Numicon® is designed to support children to develop the concepts of pattern, order, counting, seeing numbers as a whole, place value, addition and subtraction. In addition to the number tiles, the additional Numicon resources - pegs, feely bag, scales, 100 square and rods - can be used to support children to see relationships and make connections between numbers.</p>
Cuisenaire rods		<p>Cuisenaire rods are a set of rods of varying lengths and colours which can be used to visualise and represent a variety of mathematical concepts, including addition, subtraction, multiplication, division, fractions, ratio and proportion. Through visual comparison of the lengths, students can develop an understanding of relative sizes of numbers.</p>
Base Ten (Dienes)		<p>Base Ten resources can support the concept of place value. They can also be used to demonstrate addition and subtraction of larger numbers (TU and HTU) and to model the concept of decomposition in subtraction. As such they can be used to underpin the understanding of column addition and subtraction. In addition, Base Ten resources can provide a way of representing fractions.</p>
Bead strings		<p>Using a bead string for counting allows children to manipulate larger numbers and count in groups (e.g. tens). Using a line of beads to represent a number on a bead string supports children in making links to the more abstract representation of the number on a number line.</p>
Place value arrow cards		<p>Place value arrow cards reinforce the concept of place value. When children represent a number using place value arrow cards, they pile the cards so that the arrows stack up on the right-hand side of the number. Only the first digit on each card is visible (e.g. 356). The cards support children to understand the value of each digit; when the cards are separated, they can see how the number is formed e.g. a '300', a '50' and a '6' in the above example. If a child attempted to use a '3', a '5' and a '6' to make the number '356', stacking the cards would hide the '3' and the '5'. This resource helps children to understand partitioning and recombining numbers.</p>

SEND SERVICE 0-25 GUIDES

Place value grid		<p>A place value chart provides a visual representation of the different values of digits in a number. It can support children when partitioning numbers. Representing numbers on a place value grid can support understanding of what happens to a number when multiplying or dividing by a multiple of ten. This prevents children from developing the misconception that multiplying by ten means 'adding a zero'.</p>
Number line		<p>Using a number line provides a visual representation of how numbers are ordered. It can be used to develop the key skills of ordering, counting, addition, and subtraction. Number lines can also be used to explore different ways of counting on, using jumps to different points on the line. This helps to develop efficient mental strategies.</p>
Hundred square		<p>The hundred square provides a non-linear representation of numbers. This supports pattern recognition in numbers and in learning to count in groups such as twos, fives and tens and other numbers. The hundred square supports understanding of counting on and back using place value to make 'jumps of 10' up and down columns. This progresses pupils who have become 'stuck' on the strategy of using a number line to count on in 'ones' when adding a number.</p>
Multiplication grid		<p>A multiplication grid can enable access to mathematical problem solving. The grid itself is also a useful way to identify patterns in multiplication tables.</p>

Useful References and Links

[Concrete Resources Explained For Parents \(thirdspacelearning.com\)](https://thirdspacelearning.com)

[EEF Maths EY KS1 Guidance Report.pdf \(d2tic4wvo1iusb.cloudfront.net\)](https://d2tic4wvo1iusb.cloudfront.net)

[How to teach primary school maths with concrete resources \(mathsnoproblem.com\)](https://mathsnoproblem.com)

See further SEND OAP Toolkit 'How to' guides here: [Cognition and Learning: Maths](#)