LEARNING and TEACHING POINTS
for
Chapter 6
Modelling and Problem Solving

The fact that two sets of three objects – such as three cups and three spoons – share the property of 'threeness' can be experienced by the process of one-to-one matching; for example, one of the three spoons can be placed in each of the three cups. This is a key practical process for the young child that makes what is the same about three cups and three spoons explicit.

To help young children to develop understanding of number provide opportunities for them to make connections between the symbols for numbers (numerals), the language of number, such as 'four' and 'fourth', real-life situations where numbers are used in both the cardinal sense (recognizing sets of two, three, and so on) and the ordinal sense (numbering items in order), the process of counting, pictures such as set diagrams and, especially, number strips and number lines.

It is in counting the number of objects in a set that the cardinal and ordinal aspects come together. In pointing to each item in turn and numbering them, one, two, three, and so on, the child is using the ordinal aspect. The child has to learn that the ordinal number of the last number counted is the cardinal number of the set. This is a significant step in the development of the young child's understanding of number and counting.

Negative integers cannot be understood if we think of numbers only in the cardinal sense, as sets of things. We have to make the connection with numbers used in the ordinal sense, as labels for putting things in order. This is done most effectively through the image of the number line. This shows the importance of teachers using number strips and number lines with young children at every opportunity, so they begin to visualize numbers in this way and not just as sets of things.

When teaching about place value, give appropriate credit to the non-European cultures that have contributed so much to the development of numeration.

In explaining place value to children use the language of 'exchanging one of these for ten of those' as you move right to left along the powers of ten, and 'exchanging ten of these for one of those' as you move left to right.

Use coins (1p, 10p and £1) and base-ten blocks to develop children's understanding of the place-value system, particularly to reinforce the principle of exchange.

Making the connection between numbers and points on the number line provides children with a powerful image to support their understanding of number, emphasizing particularly the position of a number in relation to other numbers.

Children will first encounter the decimal point as a separator in the context of money (pounds and pence) and then in the context of length (metres and centimetres), with two figures after the point. They can use the notation in these contexts initially without having any real awareness of figures representing tenths and hundredths.

Incorporate some study of numeration systems into history-focused topics such as Egyptian and Mayan civilizations, and use this to highlight the advantages and significance of the place-value system we use today.

The use of the decimal point as a separator can extend to further experience of decimal notation in the contexts of mass (kilograms and grams) and liquid volume and capacity (litres and millilitres), with three figures after the point.

Give particular attention to the function and meaning of zero when writing and explaining numbers to children. The zero in 307 does not say 'hundred'. The 3 says 'three hundred' because of the position it is in. The zero says 'no tens'.

Once children are confident with using the decimal point as a separator in money and measurement these contexts can be used to reinforce the explanation of the idea that the figures after the point represent tenths, hundredths and thousandths.

Articulate the words 'tenths' and 'hundredths' very carefully when explaining decimal numbers; otherwise children may think you are saying 'tens' and 'hundreds'.

Explain decimal numbers by using the flat pieces in the base-ten materials to represent units; then the longs can represent tenths and the small cubes can represent hundredths.