# SEVEN DIGITS

**PROBLEM:** *Use 1, 2, 4, 4, 5, 8 or 9 to make number sentences using any operations. You can only use a digit once in any number sentence (except 4), and the whole number sentence must be made from these digits. You do not need to use all the digits in each number sentence, for example 4 + 4 = 8 is OK. Digits can be combined to make other numbers, for example 44 or 12.*

## LEVEL

**Intermediate/expert**

This depends on the number of digits used in solutions, as the challenge increases dramatically as more digits are included. Children need mental calculation skills with one-digit and two-digit numbers, knowledge of place value and understanding of order of operations for recording solutions.

## RESOURCES/GETTING STARTED

Use large digits for introducing the problem and leave some solutions for children to see. Provide digit cards for individuals or pairs, as manipulating the cards really does help thinking and explanation. Decide whether calculators are appropriate for checking solutions or as an aid to finding more answers.

$4 + 1 = 5$

$9 = 1 + 4 + 4$

$4 \times 4 + 2 = 18$

$49 \div (8 - 1) = 5 + 2$

Show the children the digits and get them to construct a number sentence by moving digits and introducing appropriate signs for operations. The usual starting point uses three digits and you can indicate the variations that are possible: 8 + 1 = 9, 1 + 8 = 9, 9 – 1 = 8, 9 – 8 = 1. These may all be regarded as one 'number sentence family' solution. Get the children to suggest ways of building on from this starting point by adjusting or replacing digits. Examples like 4 + 4 + 1 = 9 or 2 × 4 + 1 = 9 are different solutions with the same mathematical content. You must judge when most of the children understand the task so that you don't display too many answers and take over the problem from individuals. Encourage careful use of jottings with errors or 'near misses' treated positively – mistakes may provide the key to further answers, for example:

$4 + 4 = 8$ ✓

$4 + 4 + 5 = 13$ × ( no 3 )

add 8

$4 + 4 + 5 + 8 = 21$ ✓

## KEEPING THE PROBLEM GOING

The task is difficult at the outset, but gets easier as solutions are shared and variations