IDEA 2

100 SQUARE 2

These ideas are based upon shifts on the grid and one way to proceed is to show the whole class a single copy of the 100 square on a screen/board and ask students to write down some facts they know about the display of numbers. For example, students might write about how the numbers go vertically up by adding ten, or diagonally up to the right by adding 11. Students might be prompted to explore what pattern the multiples of three or the multiples of seven make, etc.

Having gathered students' responses, questions and possible tasks are likely to emerge quite naturally. Some typical questions I would certainly want to ask, with the display now switched off would be based upon '**U**p', '**D**own', '**R**ight' and '**L**eft' shifts, for example:

- If I start at 7 and go one square up, where do I end up?
- If I start at 64, go two squares down and one to the left, where do I end up?

Questions such as these will demand students engage in visualizing the grid.

The central idea here is for students to work with codes based upon the following shifts on the grid: **U** = +10, **D** = –10, **R** = +1 and, **L** = –1.

Combinations of codes leads, for example, to **UR** = +11, **DR** = –9 etc.

Having established this coding, questions might be posed such as: 57, **UUURR** = ?

A code such as 7, **DDR** will provide a context to work with negative numbers.

The coding system can be developed so 57, **UUURR** could be written as 57, 3**U**, 2**R** = ? and students can make up and pose questions similar to these for each other to solve.

This might be an appropriate point to ask students to extend the grid in all four directions for two or three rows and columns, so they gain a sense that the system is continuous once the boundary of 100 squares is removed. In Idea 36, 100 square 3, I refer to this as the *extended grid*.

IDEA 3

CARD TRICKERY 1

Trying to puzzle out the mathematics behind card tricks offers a rich vein of ideas for use in a mathematics classroom and having a number of 'tricks' up one's sleeve is useful; perhaps wheeling out a trick to add an element of intrigue into a lesson.

The following trick is taken from Martin Gardner's *Mathematics, Magic and Mystery* (Dover, 1956).

I saw it being used with great success by Phil Meek and David Rees at a PGCE Mathematics Activity Day (MAD).

The trick needs a deck of cards to be 'fixed' in the following way:

- On top of a deck of cards place eight cards so none of them are Aces.
- Now place the four Aces as card numbers nine, ten, eleven and twelve (from the top).
- Ask someone to call out any number between 10 and 20 (e.g. 17).
- Deal this number of cards off the top of the deck and place them face down; one, two, three . . . sixteen, seventeen. This means that the first card to be counted off the top of the deck becomes the card at the bottom of the pile of seventeen cards once they have been counted out. I shall refer to this as the 'new' pile.
- Next add together the digits of the number called out (1 + 7) and whatever this value is (i.e. 8), return this number of cards from the new pile back to the main deck; one, two, three . . . seven, eight.
- Take the next card on top of the (reduced) new pile and place this in an envelope.

Return all the cards in the new pile, that were initially dealt, back to the main deck and repeat the last four instructions three more times.

By the end of the trick you should have four cards in the envelope.

Ask someone to open the envelope and inside will be all four Aces . . . it's magic . . . well actually it is simple arithmetic, but who's counting? (And therein lies the solution!)