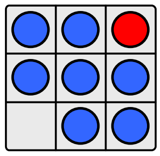
corner to corner

intro

Maths games and puzzles sometimes lead to interesting investigations. As a puzzle, ‘corner to corner’ is simple enough but it can be used as the starting point of a challenging investigation. In fact, it’s a double challenge – it takes some effort to obtain the results and then there’s a pattern which is not all that easy to see . . .



first steps

First of all, pupils should familiarise themselves with the ‘corner to corner’ puzzle : starting with a 3 x 3 grid and counters arranged as above, the challenge is to get the red counter from the top right-hand square to the bottom left-hand square in only 13 moves (where for any counter a ‘move’ means a slide into an adjacent empty square – which can be left / right or up / down ie no diagonal moves here and no jumping over!)

the investigation

Having got used to the puzzle on a 3 x 3 grid, pupils should now investigate 2 x 2, 4 x 4, 5 x 5 etc versions, each time aiming to establish the minimum number of moves needed to get the red counter home . . .

practical

This investigation is best carried out in pairs – one pupil can move the counters whilst the other pupil keeps count of the moves.

results

Here are the results which (we hope) will emerge :

square		minimum number of moves
2 x 2	⇨	5
3 x 3	⇨	13
4 x 4	⇨	21
5 x 5	⇨	29
6 x 6	⇨	37
. . .		. . .

notes

There is a pattern here which in one way is easy to spot : as you go up through 2 x 2, 3 x 3, 4 x 4 and so on, you just keep adding 8 to the minimum number of moves. But what about a general rule? What would the minimum number of moves be for a 20 x 20 square? Or for a 50 x 50 square? Or for a 100 x 100 square? Pupils might or might not be able to spot the general rule, which is :

for an n x n square, $n \Rightarrow 8n - 11$

