McGuire says 17 clues is the minimum required to solve the puzzles, left
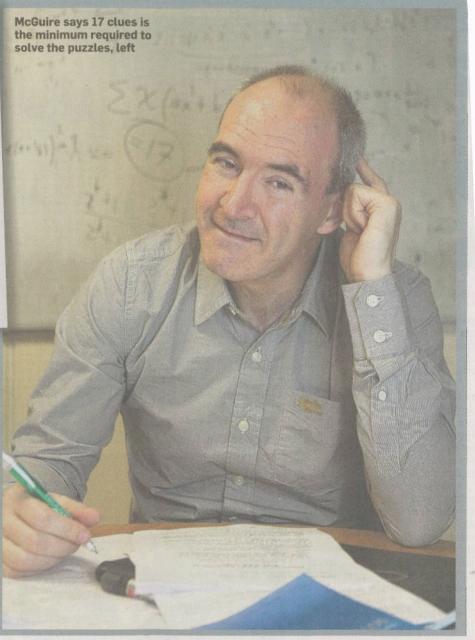
Solution to big Sudoku conundrum

An academic reveals the answer to a poser that has confounded many fans, says **Eileen Martin**

IT IS the ultimate Sudoku puzzle: what is the minimum number of clues needed to complete one of the logical posers? Some of the world's sharpest minds have been vying for a decade to succeed by using fewer than 17 numbers.

Professor Gary McGuire, from the school of mathematical sciences at UCD, has established that doing it with 16 clues is impossible, proving that 17 is the answer to the conundrum.

Using a complex algorithm he devised, known as Checker, McGuire eliminated billions of possible combinations of numbers to prove a 16-clue puzzle cannot be solved. Helped by a German programmer, Bastian Tugemann, he searched 5.5 billion possible Sudoku grids over three years.

"When we first started it was taking about one hour for each case, which meant the whole thing would have taken 300,000 years on one computer," McGuire said. "After a lot of hard work improving our algorithm, each case now took around four seconds on a standard computer."

The computation would still have lasted for 700 years on one machine, so McGuire applied for the simultaneous use of 700 processors through the Irish Centre for High-End Computing (ICHEC), allowing him to finish the calculation in one year, or 7m central-processing unit hours.

The search was completed on Christmas Eve, and McGuire releases his findings today. He is due to publish a paper on arxiv.org, an open website for academic research, and post his discovery on his own site, math.ie/checker.html.

Several research teams, including one from Taiwan, are believed to be close to completing their work on the answer to Sudoku's greatest puzzle. Many use an earlier version of Checker, which McGuire made public in 2005.

"The question of what is the minimal number of Sudoku clues to produce a unique solution has occurred to a lot of people," said McGuire. "There have been many attempts to find out, and an online forum has been abuzz discussing this problem for several years. Every inroad anyone claims to have made is checked thoroughly."

Although associated with Japan, Sudoku is thought to have been devised in America in 1979 as a variation on the Latin square, an arrangement of numbers or symbols. The object is to fill a partially-completed 9x9 (81-square) grid with numbers so that each column, row and 3x3 sub-grid contains all the digits from one to nine.

Sudoku failed to take off in America but became popular in Japan in 1997, when Wayne Gould, a New Zealander and retired Hong Kong judge, developed a computer programme to produce puzzles quickly. Gould promoted the puzzle to The Times, and the first "Su Doku" appeared in the newspaper in November 2004.

Sudoku is notoriously addictive, and last month the driver of a school bus in Dorset was sacked after tackling a puzzle while at the wheel. A pupil took a photograph of the driver with a Sudoku book balanced on the steering wheel.

Most national newspapers, including The Sunday Times, carry Sudoku puzzles. The standard grid gives 25 to 30 clues, with the difficulty measured by the number given and how each is positioned.