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Editorial

Dear Readers

Since the last issue of *Parabola Incorporating Function* the mathematics world has been surprised by the appearance of a preprint, dated May 2011, by the German mathematician Gerhard Opfer who claimed to have proved the Collatz Conjecture. And then, some weeks later, other mathematicians reported that the proof was flawed and Opfer updated his preprint on 17 June 2011 with "the statement 'that the Collatz conjecture is true' has to be withdrawn, at least temporarily". The Collatz Conjecture is one of those remarkable mathematical problems that is easy to state and easy to check but difficult to prove. Starting with any natural number $n_0 > 1$, multiply the number by three and then add one if it is odd, or divide the number by two if it is even to construct another natural number n_1. Then apply the same rule to n_1 to construct another natural number n_2 and so on, but stop if you ever reach the number 1. The Collatz Conjecture says that the sequence $n_0, n_1, n_2, \ldots$ will always reach the number 1. Try it out, suppose we start with seven, then we obtain the sequence:

$$7, 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1$$

The Wikipedia page on the Collatz Conjecture is very informative.

Proofs based on deductive reasoning are fundamental to mathematics. In this issue, Catherine Greenhill describes applications of deductive reasoning in solving Sudoku puzzles. In doing so she provides very nice illustrations of direct proof, proof by exhaustion, proof by contradiction and proof by mathematical induction. David Angell's problems in this issue all require deductive reasoning and they are excellent for practising these skills. Farid Haggar's article is related to the proof of innocence or guilt in a court case. This is a different kind of proof. Deductive reasoning comes into play but in court cases the proof depends on the weight of evidence and is based on what is reasonable. Farid's article uses mathematics to explore different possibilities to consider what is reasonable in the case of a body exiting a cliff. The Collatz Conjecture has been tested and found to hold for all numbers up to 5,764,000,000,000,000,000. The weight of evidence here is surely that it is reasonable to suppose that the conjecture is correct, but this is not sufficient for a mathematical proof.

Michael Deakin's article on the History of Mathematics looks more deeply at Geoffrey Ingram Taylor's calculations relating the blast radius to the energy yield from the first atomic test.

Editor

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