Study of the Cubic Sum of Digits in Natural Numbers

Lopez-Sierra, Carlos

Sarritzu-Abreu, Eugenio

The main purpose of the present research is contributing to the area of number theory. It is focused on the study of properties observed in the set of natural numbers when applied to the cubic sum of digits algorithm. For any given natural number n, a defined function v(n) is equal to the sum of the cube of its digits. The cubic sum of digits algorithm can be described as a finite number of iterations of v(n). The hypothesis of the research is that after applying the algorithm to any natural number n, the process will end after a certain number of iterations. Numbers of one to 15 digits were applied to the algorithm using a computer program. It was observed that every number of this interval resulted in a fixed point or in an orbit of length two or length three. With the gathered data, a conjecture was formulated. However, it was demonstrated by mathematical induction, being true for every natural number. Generalizing, the cubic sum of digits theorem states that every natural number n, after being applied to the algorithm, will satisfy the respective properties and will end in a fixed point or an orbit. On the other hand, the findings of this research contribute to automata theory, one application being programming languages. The most important aspect in future work is predicting the number of iterations required for a natural number to satisfy its respective property.

Awards Won: