Base 1.5: Analysis of Properties and Relation to the Collatz Conjecture

Michel, Jesse (School: Southwestern Educational Society)

Theoretical base 1.5 was modeled through the concept of Exploding Dots, which allows place values larger than the standard one less than the base. The ability to use larger place values avoided the difficulty of using fractional digits, and instead trinary numbers were used in conjunction with base 1.5 place values (incrementally increasing powers of 1.5). Parity analysis on sums of n terms of the product of place values and their coefficients of 0, 1, or 2 was performed. The properties of base 1.5 were shown to align closely with Collatz numbers because of their erratic switching among numbers in the form 3n+1 and n/2. Patterns of base 1.5 were discovered via computer programs. Its properties were modeled in Java and analysis of trends were performed by Excel. Another approach to fractional bases was developed and its properties were analyzed as well. Ultimately, a new perspective was developed to progress on a proof of the Collatz Conjecture through properties of base 1.5 numbers in various forms.

Awards Won:

Second Award of $2,000