Collatz Conjectures

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First Conjecture

For any integer n, 2^n will always give the quickest route to the end of the Collatz sequence. For the same integer n, it will always converge and the sequence will terminate in $n + 1$ number of terms. Every term in this sequence will be an even number and able to be divided by 2 until the last number of the sequence, which is 1.

Second Conjecture

For any odd integer n, 2^n there is only one way to arrive at that number in the Collatz Conjecture. For any even integer n, in 2^n there are 2 ways to get to the number. (This adds the branching shown in class where $2^2 = 4$ there is 2 ways, but $2^3 = 8$ there is only one way to get to 8).

Third Conjecture

For any integer n, in $2 * ((4^n - 1)/3)$ the Collatz terms will always begin with an odd number term, and after the 3rd term will enter the fastest track to the end the sequence. For any integer n, in $2 * ((4^n - 1)/3)$ the number of terms can be found by $n * 2 + 3$.

Proof

Let 2^n be an odd integer. We want to show that the number of terms held in the Collatz Conjecture is $n + 1$.