# Exploring Collatz Conjecture

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Collatz Conjecture was created in the 1930s by Lothar Collatz and has perplexed mathematicians for almost a century. The Collatz problem is an iteration of n/2, when n is even, and 3x+1, when x is odd. The Collatz Conjecture states that all integers will reach the value one as it goes through the iteration. Terry Tao, a famous mathematician, made a breakthrough discovery on the problem using a statistical weighting method to show that almost all numbers reach one; however, he still did not solve it. An integer that increases for infinity in the iteration will disprove this conjecture. By maintaining an even, odd pattern throughout the iteration, a number will increase to infinity. The purpose of this research was to find a way to maintain an even, odd pattern by analyzing the unit digits of an integer’s sequence. An ANOVA was done to analyze the average Collatz Sequence length for integers that ended with each unit digit. The results were that the unit digit did not affect the sequence length. After analyzing multiple sequences, a formula was found to extend a numbers even, odd pattern. By repeating the formula on a number, the even, odd pattern will continue to increase for infinity; however, a finite number that disproves Collatz Conjecture is never found. This research failed at disproving Collatz Conjecture, but a way to control the numbers in the sequence was found. These findings could influence the works of future mathematicians that attempt to solve this problem.

**Awards Won:**