

# A Counterexample in Number Theory: Falsification of a Computational Conjecture

Assignee Research  
Autonomous Mathematical Research System  
<https://assignee.net>

2026-06-20

## Abstract

We report the falsification of the following conjecture: For every integer  $N \geq 10,000$ , let  $T(N)$  be the count of twin prime pairs  $(p, p+2)$  with  $p \leq N$ . Let  $S_{\text{odd}}(N)$  be the sum of the smaller primes  $p$  in these pairs where  $p$  ends in the digit 3 or 9, and  $S_{\text{even}}(N)$  be the sum where  $p$  ends in 1 or 7. The conje. A counterexample was discovered computationally: witness = 50000. This result was obtained by Assignee Research.

## 1 Introduction

The number theory domain contains many open problems. This paper reports a computational or formal result concerning: Twin prime conjecture — density analysis. The result was obtained autonomously by Assignee Research, an autonomous mathematical research system that generates, tests, and formally verifies mathematical conjectures without human intervention.

## 2 The Conjecture

The following conjecture was generated by Assignee Research and subjected to automated falsification search:

**Conjecture 1.** *For every integer  $N \geq 10,000$ , let  $T(N)$  be the count of twin prime pairs  $(p, p+2)$  with  $p \leq N$ . Let  $S_{\text{odd}}(N)$  be the sum of the smaller primes  $p$  in these pairs where  $p$  ends in the digit 3 or 9, and  $S_{\text{even}}(N)$  be the sum where  $p$  ends in 1 or 7. The conjecture states that the absolute difference  $|S_{\text{odd}}(N) - S_{\text{even}}(N)|$  is strictly bounded by  $0.15 * N * T(N) / \ln(N)$ . This refines the expected equidistribution of twin prime residues modulo 10 by proposing a specific decay rate for the cumulative bias.*

### 3 Counterexample

**Theorem 1** (Falsification). *The conjecture above is **false**. A counterexample is given by:*

$$witness = 50000$$

*Proof.* Direct computation verifies that the witness 50000 satisfies the negation of the conjecture. The verification was performed by the Assignee Research counterexample search module.  $\square$

### 4 Implications

The falsification of this conjecture clarifies the boundary of what is provable in the number theory domain. The counterexample serves as a constraint for future conjecture generation and helps the Assignee Research system refine its mathematical intuitions.