Collatz-6

A new dynamical system in the 6-adic world

1. What is Collatz 6?

Collatz 6 is a variant of the Collatz map defined in a 6-adic structure. It combines **6-adic gravity** (division by 2, 3, and 6) with **7n ± 1 jumps**, producing behaviors not seen in the classical problem— especially **gliders**, orbits that repeatedly escape downward collapse.

2. The Collatz 6 Map

For any integer n:

- if n ≡ 0 (mod 6) → n / 6
- if n ≡ 2 or 4 (mod 6) → n / 2
- if n ≡ 3 (mod 6) → n / 3
- if n ≡ 1 (mod 6) → (7n − 1) / 6^{v6(7n − 1)}
- if n ≡ 5 (mod 6) → (7n + 1) / 6^{v6(7n + 1)}

Here **v6(n)** is the largest integer k such that 6^k divides n.

3. Pure Jumps (v6 = 0)

A **pure jump** occurs when: v6(7n ± 1) = 0. Then: T(n) = 7n ± 1 with **no division**. Pure jumps cause rapid growth and are the key mechanism behind gliders.

4. Gliders

A glider is an orbit that:

- repeatedly enters n ≡ 1 or 5 (mod 6),
- triggers many 7n ± 1 jumps,
- exhibits infinitely many pure jumps,
- avoids long division sequences,
- and grows instead of converging.

Gliders are unique to the 6-adic system.

5. The Chaos Rim

The residue classes **1** and **5** modulo 6 form the **Chaos Rim**— the boundary where 7n ± 1 jumps occur. Orbits that frequently return to the Chaos Rim have the potential to become gliders.

6. Fibonacci Numbers

Fibonacci numbers often satisfy: $F_n \equiv 1$ or 5 (mod 6), so they naturally fall on the Chaos Rim. They trigger many 7n ± 1 jumps, but for F_1–F_{20}, **no pure jump has yet been observed**. Finding the first Fibonacci number with v6 = 0 is an open challenge.

7. Escape Candidates

Some numbers show long upward drift with few divisions. The strongest known example is:

20737. which repeatedly returns to the Chaos Rim and grows persistently. It is the leading **escape candidate** for an unbounded orbit.

8. Purpose

This overview introduces the core ideas of Collatz 6 and invites exploration. Open problems include:

- First Fibonacci number with a pure jump
- Existence of true gliders
- Behavior of 20737
- Structure of the Chaos Rim
- Distribution of v6 in 7n ± 1

Collatz 6 is a new mathematical world. Exploration begins here.

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