

How to Explore Collatz-5

1. Compute Orbits

Choose any integer n and repeatedly apply the Collatz-5 map.

Track each step, record $n \bmod 5$, and note when the orbit stays on the Outer Circuit or drops into a deeper layer.

Even small numbers reveal the layered structure of the 5-adic world.

2. Watch the Outer Circuit

The classes $n \bmod 5 = 1, 2, 3, 4$ form the Outer Circuit.

This is where racers accelerate, oscillate, and produce glider-like motion.

Key observations:

- How long the orbit stays in the Outer Circuit
- How often it drops into the deep layer ($\bmod 5 = 0$)
- Whether the orbit tends to rise or collapse

Long Outer-Circuit runs indicate glider behavior.

3. Detect Deep-Layer Drops ($\bmod 5 = 0$)

A drop occurs when $n \bmod 5 = 0$, sending the racer into a deeper layer:

$$f(n) = n / 5.$$

This sharply reduces the value and interrupts growth.

Important to track:

- Frequency of drops
- How quickly the orbit returns to the Outer Circuit
- The peak value reached before each drop

Few drops often signal strong glider potential.

4. Search for Gliders

A glider is an orbit that:

- repeatedly stays in $n \bmod 5 \neq 0$
- avoids frequent deep-layer drops
- reaches high maximum values
- shows upward drift over long intervals

To test for glider behavior, examine:

- long-term growth of the orbit
- ratio of Outer-Circuit steps to drops
- how often maximum values increase

Gliders are the signature phenomenon of Pentadica.

5. Explore $P(3,2)$ Numbers

Numbers in the $P(3,2)$ sequence avoid divisibility by 2, 3, and 5.

They naturally remain on the Outer Circuit and often behave as elite racers.

What to look for:

- unusually long Outer-Circuit runs
- large maximum values

- rare deep-layer drops

The strongest known example is **774,840,977**, a Legendary Glider.

6. Investigate Escape Candidates

Some numbers show persistent upward drift with very few drops. These appear to “almost escape” the system.

Track:

- long-term growth over thousands of steps
- spacing between drops
- repeated updates of the maximum value

Such numbers reveal the upper dynamics of Pentadica.

7. Build Simple Tools

Small programs can uncover deep structure.

Useful tools include:

- an orbit generator
- a mod-5 classifier
- a lap counter
- a drop detector
- a maximum-value tracker
- a growth-rate analyzer

Even minimal scripts can reveal new patterns.

8. Share Your Findings

Collatz-5 is a new mathematical world.

Every orbit, anomaly, or pattern contributes to exploration.

Interesting results include:

- long glider trajectories
- rare-drop orbits
- new escape candidates
- unusual $P(3,2)$ behavior
- statistical patterns in laps and maximum values

Exploration begins with your experiments.

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