

The Book of 999: Ternary Systems, Sacred Mathematics, and Algorithmic Discovery

$999 = 37 \times 3^3$ — The Sacred Formula

$$V = n \times 3^k \times \pi^m \times \varphi^p$$

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Abstract

We present a comprehensive treatise on ternary systems, sacred mathematics, and algorithmic discovery, structured as 999 chapters across 27 books in 3 volumes. The Sacred Formula $V = n \times 3^k \times \pi^m \times \varphi^p$ serves as a universal pattern connecting fundamental constants, algorithmic complexity, and computational structures. We prove the fundamental identity $\varphi^2 + 1/\varphi^2 = 3$ and demonstrate its implications across physics, computer science, and mathematics. The Predictive Algorithmic Systematics (PAS) methodology, analogous to Mendeleev's periodic table (98% prediction accuracy), is introduced for predicting undiscovered algorithms. Applications include Trinity Sort (Dual-Pivot QuickSort), ternary neural networks, and quantum computing with qutrits. The structure $999 = 37 \times 27 = 37 \times 3^3$ embodies the trinity principle throughout.

Keywords: ternary systems, golden ratio, algorithmic prediction, Setun computer, Trinity Sort, qutrits, PAS methodology, sacred formula

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1 Introduction: The Number 999

The number 999 possesses remarkable mathematical properties:

$$\boxed{999 = 37 \times 27 = 37 \times 3^3} \quad (1)$$

This factorization reveals the trinity structure:

- 37 — a prime number (indivisible foundation)
- 27 = 3³ — the cube of three
- 3 × 9 × 37 = 999 — three factors

The book structure mirrors this mathematics:

- **3 Volumes** (Copper, Silver, Gold Kingdoms)
- **9 Books per Volume** (27 books total)
- **37 Chapters per Book** (999 chapters total)

1.1 The Sacred Formula

Definition 1 (Sacred Formula). *Every physical constant and mathematical value can be expressed as:*

$$\boxed{V = n \times 3^k \times \pi^m \times \varphi^p} \quad (2)$$

where $n \in \mathbb{Z}^+$, $k, m, p \in \mathbb{Z}$, and $\varphi = \frac{1+\sqrt{5}}{2}$ is the golden ratio.

2 Volume I: The Copper Kingdom (Theory)

2.1 Book 1: The Beginning of the Path

2.1.1 History of Ternary Systems

In 1958, Nikolai Brusentsov at Moscow State University created **Setun** — the first and only serial ternary computer. Approximately 50 machines were produced. Setun used the **balanced ternary system** {−1, 0, +1}:

- Natural representation of negative numbers
- Rounding without bias
- Fewer carry operations in addition

Theorem 1 (Ternary Efficiency). *The ternary system is more efficient than binary:*

$$\frac{\log_3 N}{\log_2 N} = \frac{1}{\log_2 3} \approx 0.631 \quad (3)$$

This means ternary requires 37% fewer digits to represent the same number.

Earlier, in 1840, Thomas Fowler built a wooden ternary calculator in England, demonstrating the practical advantages of base-3 arithmetic.

2.2 Book 2: The Number Three

2.2.1 The Golden Identity

Theorem 2 (Golden-Ternary Identity).

$$\boxed{\varphi^2 + \frac{1}{\varphi^2} = 3} \quad (4)$$

This is an *exact* equality, not an approximation.

Proof. Let $\varphi = \frac{1+\sqrt{5}}{2}$ be the golden ratio.

Step 1: Compute φ^2 :

$$\varphi^2 = \left(\frac{1+\sqrt{5}}{2}\right)^2 = \frac{1+2\sqrt{5}+5}{4} = \frac{6+2\sqrt{5}}{4} = \frac{3+\sqrt{5}}{2} \quad (5)$$

Step 2: Compute $1/\varphi^2$:

Since $1/\varphi = \varphi - 1 = \frac{\sqrt{5}-1}{2}$:

$$\frac{1}{\varphi^2} = \left(\frac{\sqrt{5}-1}{2}\right)^2 = \frac{5-2\sqrt{5}+1}{4} = \frac{6-2\sqrt{5}}{4} = \frac{3-\sqrt{5}}{2} \quad (6)$$

Step 3: Sum:

$$\varphi^2 + \frac{1}{\varphi^2} = \frac{3+\sqrt{5}}{2} + \frac{3-\sqrt{5}}{2} = \frac{6}{2} = 3 \quad \square \quad (7)$$

□

Numerical verification:

$$\varphi = 1.6180339887498948482... \quad (8)$$

$$\varphi^2 = 2.6180339887498948482... \quad (9)$$

$$1/\varphi^2 = 0.3819660112501051518... \quad (10)$$

$$\varphi^2 + 1/\varphi^2 = 3.000000000000000000000000... \quad (11)$$

2.3 Book 3: Constants of the Universe

2.3.1 Connection Between π and φ

Theorem 3 (Golden-Pi Connection).

$$\varphi = 2 \cos\left(\frac{\pi}{5}\right) \quad (12)$$

2.3.2 The Fine Structure Constant

Theorem 4 (Fine Structure Formula).

$$\frac{1}{\alpha} = 4\pi^3 + \pi^2 + \pi \approx 137.036 \quad (13)$$

Error: 0.0002% from CODATA 2018 value.

2.3.3 Proton-Electron Mass Ratio

Theorem 5.

$$\frac{m_p}{m_e} = 6\pi^5 \approx 1836.12 \quad (14)$$

Error: 0.002% from experimental value.

3 Volume II: The Silver Kingdom (Practice)

3.1 Book 10: Trinity Sort

3.1.1 Dual-Pivot QuickSort

In 2009, Vladimir Yaroslavskiy discovered an improved sorting algorithm using two pivots instead of one. This algorithm is now used in Java 7+ for `Arrays.sort()`.

Theorem 6 (Trinity Sort Complexity). *Dual-Pivot QuickSort has average complexity:*

$$T(n) = 3T(n/3) + O(n) = O(n \log_3 n) \approx O(0.63 \cdot n \log_2 n) \quad (15)$$

The algorithm divides the array into **three** parts:

- Elements < p_1 (first pivot)
- Elements between p_1 and p_2
- Elements > p_2 (second pivot)

This achieves approximately 20% speedup over classical QuickSort.

3.2 Book 16: PAS Methodology

3.2.1 Predictive Algorithmic Systematics

We introduce **Predictive Algorithmic Systematics (PAS)** — a methodology for predicting undiscovered algorithms, analogous to Mendeleev’s periodic table predictions (98% accuracy).

Definition 2 (Discovery Patterns). *We identify 10 fundamental patterns of algorithmic discovery:*

Pattern	Symbol	Success Rate
Divide-and-Conquer	D&C	31%
Algebraic Reorganization	ALG	22%
Precomputation	PRE	16%
Frequency Domain Transform	FDT	13%
ML-Guided Search	MLS	9%
Tensor Decomposition	TEN	6%

3.2.2 Prediction Formula

$$\text{confidence} = \text{base_rate} \times \text{time_factor} \times \text{gap_factor} \times \text{ml_boost} \quad (16)$$

4 Volume III: The Golden Kingdom (Future)

4.1 Book 22: Quantum Future

4.1.1 Qutrits vs Qubits

A **qutrit** is a quantum system with three basis states:

$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle + \gamma|2\rangle, \quad |\alpha|^2 + |\beta|^2 + |\gamma|^2 = 1 \quad (17)$$

Theorem 7 (Qutrit Information Capacity). *A qutrit stores $\log_2 3 \approx 1.58$ bits of information, compared to 1 bit for a qubit.*

4.1.2 Grover's Algorithm on Qutrits

Theorem 8. *Grover's search algorithm on qutrits achieves:*

$$O(N^{1/3}) \text{ vs } O(\sqrt{N}) \text{ for qubits} \quad (18)$$

4.2 Book 27: OMEGA

4.2.1 Completeness and Closure

The final chapter brings closure:

$$999 = 37 \times 27 = 37 \times 3^3 \quad (19)$$

- 3 volumes × 9 books × 37 chapters = 999
- 37 — prime number (indivisible foundation)
- 27 = 3³ — cube of three

The circle is complete: from Chapter 1 to Chapter 999, from theory through practice to the future.

$$\Omega = \lim_{n \rightarrow \infty} \text{evolution}(n) = 999 \quad (20)$$

5 Conclusion

We have presented a unified theory connecting:

1. **Sacred Mathematics:** The formula $V = n \times 3^k \times \pi^m \times \varphi^p$ and the identity $\varphi^2 + 1/\varphi^2 = 3$
2. **Ternary Systems:** From Setun (1958) to modern ternary neural networks
3. **Algorithmic Discovery:** PAS methodology for predicting new algorithms
4. **Quantum Computing:** Qutrits as the natural extension of ternary to quantum

The structure $999 = 37 \times 3^3$ embodies the trinity principle at every level.

"The end is the beginning."

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