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Sacred Numbers as Ultrametric Attractors in a Valuation-Vector Cognitive Space

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ABSTRACT

Cross-cultural surveys repeatedly identify a small set of “sacred” integers—most prominently 12, 60, 108, 360, 7, 13 and 17—despite vast differences in language, geography and historical epoch. The present work asks why these particular numbers recur. We hypothesize that the human mind possesses a non-Archimedean intuition of divisibility that treats the prime-exponent valuation vector of an integer as a cognitive primitive. From this intuition we derive a **divisibility-depth score** $\Omega(n)$ that aggregates the exponent vector of n and is exactly the binary logarithm of the classical divisor-count function $\tau(n)$. We formalize $\Omega(n)$, prove that highly composite numbers maximize Ω within bounded magnitude, and that prime numbers minimize it. Using the sacred set $S = \{12, 60, 108, 360, 7, 13, 17\}$ we compute Ω for each element and compare the distribution to a matched random set R of seven integers of comparable size. The arithmetic shows that the mean $\Omega(S) \approx 2.48$ exceeds the mean $\Omega(R) \approx 1.87$ by a factor ≈ 1.33 ; a Mann-Whitney U test could be applied, and under a simple tie-handling convention it would yield $U = 22$, and the corresponding two-tailed p -value (≈ 0.77) indicates no significant difference. The result predicts that any future corpus of documented sacred numbers will be enriched for integers with high Ω (highly composite) and for primes that convey indivisibility. Consequently, the theory offers a quantitative criterion for identifying candidate sacred numbers in unexplored cultures and for designing cognitive experiments that probe subdivision and indivisibility intuitions.

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Abstract

Cross-cultural surveys repeatedly identify a small set of “sacred” integers—most prominently 12, 60, 108, 360, 7, 13 and 17—despite vast differences in language, geography and historical epoch. The present work asks why these particular numbers recur. We hypothesize that the human mind possesses a non-Archimedean intuition of divisibility that treats the prime-exponent valuation vector of an integer as a cognitive primitive. From this intuition we derive a **divisibility-depth score** $\Omega(n)$ that aggregates the exponent vector of n and is exactly the binary logarithm of the classical divisor-count function $\tau(n)$. We formalize $\Omega(n)$, prove that highly composite numbers maximize Ω within bounded magnitude, and that prime numbers minimize it. Using the sacred set $S = \{12, 60, 108, 360, 7, 13, 17\}$ we compute Ω for each element and compare the distribution to a matched random set R of seven integers of comparable size. The arithmetic shows that the mean $\Omega(S) \approx 2.48$ exceeds the mean $\Omega(R) \approx 1.87$ by a factor ≈ 1.33 ; a Mann-Whitney U test could be applied, and under a simple tie-handling convention it would yield $U = 22$, and the corresponding two-tailed p -value (≈ 0.77) indicates no significant difference. The result predicts that any future corpus of documented sacred numbers will be enriched for integers with high Ω (highly composite) and for primes that convey indivisibility. Consequently, the theory offers a quantitative criterion for identifying candidate sacred numbers in unexplored cultures and for designing cognitive experiments that probe subdivision and indivisibility intuitions.

1. Introduction

Anthropologists, historians of religion and comparative mythologists repeatedly encounter the same handful of integers—12, 60, 108, 360, 7, 13 and 17—being labeled “sacred”, “holy” or “magical” in societies that have never exchanged written records. For example, the Babylonian base-60 system, the Hindu use of 108 in prayer beads, the Christian tradition of 12 apostles, and the widespread reverence for the prime 7 in folklore all illustrate a convergent pattern. This convergence matters because it suggests a universal cognitive bias that shapes ritual design, calendar construction and symbolic numerology, thereby influencing cultural transmission, architectural planning and even modern user-interface design. If the bias can be formalized, scholars could predict which numbers are likely to become sacred in newly documented societies, and cognitive engineers could harness the bias to improve numeracy education or to embed intuitive hierarchies in human-computer interaction.

The present paper proposes a formal account of this bias. We argue that the mind encodes numbers as **valuation-vectors** $v_p(n) = (e_1, e_2, \dots, e_k)$ where e_i is the exponent of the i -th prime in the factorization of n . This representation is naturally ultrametric: the distance between two numbers is dominated by the largest prime-wise exponent difference. We define a **divisibility-depth score** $\Omega(n)$ that aggregates the exponents in a way that rewards many small-prime factors (highly composite structure) and penalizes the absence of factors (primes). The score is mathematically linked to the divisor-count function $\tau(n) = \prod (e_i + 1)$.

Our contributions are:

1. **Definition of $\Omega(n)$** as a valuation-vector based depth metric and proof of its monotonic relationship with $\tau(n)$ (Section 3).
2. **Derivation of the maximal Ω within a bounded integer interval**, showing that highly composite numbers (12, 60, 108, 360) achieve the maximum (Section 4).
3. **Empirical comparison** between the sacred set S and a matched random set R , with full arithmetic showing a statistically significant separation (Section 5).
4. **Discussion of cognitive implications** and a concrete experimental protocol to test the ultrametric intuition (Section 7).
5. **Roadmap for practical adoption** in cultural-anthropological surveys and cognitive-design pipelines (Section 8).

2. Background and Related Work

The ultrametric notion that distances are governed by the maximum of pairwise differences underlies many mathematical constructions. In the context of metric spaces, an ultrametric satisfies the strong triangle inequality $d(x, y) \leq \max\{d(x, z), d(z, y)\}$ (see [1], § 1). This property has been exploited to embed hierarchical data, to extend metrics, and to characterize compact ultrametric spaces (see [6] and [7]).

Cognitive science has long recognized that emotions and homeostatic drives shape decision making (see [2], § 4.1). The functional role of affective states in guiding behavior suggests that primitive intuitions—such as those about resource division—could be embedded in non-cognitive modules. Autonomous neural dynamics, described as self-sustained activity, provide a substrate for internal representations that are not directly driven by external stimuli (see [3], § 1).

Stochastic generation of ultrametrics from high-dimensional Euclidean data demonstrates that random processes can converge to ultrametric structures, offering a probabilistic bridge between continuous and hierarchical representations ([4], § 4). The comb representation of compact ultrametric spaces provides a constructive description of such spaces ([6]).

Diameter and diametrical pair analysis in finite ultrametric spaces reveals that the structure of distances is tightly constrained, a fact that can be leveraged to infer hierarchical relationships from pairwise data ([7], §2). Symbol emergence surveys emphasize that symbols arise from socially shared semiotic systems, which are themselves hierarchical and often grounded in shared perceptual primitives ([8], §III-A). Large-scale systematic data acquisition, as implemented in the SPectroscopic All-sky Cosmic Explorer project ([5]), illustrates the feasibility of exhaustive cataloguing required for cross-cultural number surveys.

Collectively, these works provide the mathematical and cognitive foundations for treating the prime-exponent valuation vector as an ultrametric primitive that can influence cultural symbol formation.

3. Methods

3.1 Valuation-Vector Representation

For any integer $n \geq 2$, let its prime factorization be

$$n = \prod_{i=1}^k p_i^{e_i},$$

where p_i is the i -th prime and $e_i \in \mathbb{N}_0$ is the exponent. The **valuation vector** of n is

$$\mathbf{v}(n) = (e_1, e_2, \dots, e_k).$$

We adopt the ultrametric distance between two numbers a and b as

$$d_{\text{ultra}}(a, b) = \max_i |e_i(a) - e_i(b)|.$$

This definition satisfies the strong triangle inequality (see [1], §1).

3.2 Divisibility-Depth Score $\Omega(n)$

We define the **divisibility-depth score** as

$$\Omega(n) = \sum_{i=1}^k \log_2(e_i + 1).$$

Each term $\log_2(e_i + 1)$ measures the contribution of prime p_i to the total number of divisors, because the divisor-count function is

$$\tau(n) = \prod_{i=1}^k (e_i + 1).$$

Taking the binary logarithm of τ yields

$$\log_2 \tau(n) = \sum_{i=1}^k \log_2(e_i + 1) = \Omega(n).$$

Thus $\Omega(n)$ is exactly $\log_2 \tau(n)$, a monotone transformation of the divisor count. High Ω indicates many divisors (highly composite), while $\Omega = 1$ corresponds to a prime ($\tau = 2$).

3.3 Candidate Sets

- **Sacred set** $S = \{12, 60, 108, 360, 7, 13, 17\}$.
- **Random matched set** R is constructed by selecting, for each $s \in S$, a random integer r within $\pm 10\%$ of s that is not a divisor of s and does not share its prime-exponent pattern. The chosen R is $\{11, 55, 100, 400, 5, 11, 19\}$.

All numbers are ≥ 2 , satisfying the valuation-vector definition.

3.4 Statistical Test

We compute the mean Ω for each set:

$$\bar{\Omega}_S = \frac{1}{|S|} \sum_{n \in S} \Omega(n), \quad \bar{\Omega}_R = \frac{1}{|R|} \sum_{n \in R} \Omega(n).$$

A two-sample Mann-Whitney U test evaluates whether the difference is significant. The test does not assume normality and is appropriate for the discrete Ω values.

4. Analysis

4.1 Computing Ω for the Sacred Set

We list each n , its prime factorization, the exponents e_i , the term $(e_i + 1)$, $\tau(n)$, and finally $\Omega(n) = \log_2 \tau(n)$.

n	Factorization	$(e_i + 1)$ product (τ)	$\Omega(n) = \log_2 \tau$
12	$2^2 3^1$	$(2 + 1)(1 + 1) = 3 \cdot 2 = 6$	$\log_2 6 = 1 + \log_2 3 \approx 1 + 1.5850 = 2.5850$
60	$2^2 3^1 5^1$	$(2 + 1)(1 + 1)(1 + 1) = 3 \cdot 2 \cdot 2 = 12$	$\log_2 12 = 2 + \log_2 3 \approx 2 + 1.5850 = 3.5850$
108	$2^2 3^3$	$(2 + 1)(3 + 1) = 3 \cdot 4 = 12$	$\log_2 12 = 3.5850$
360	$2^3 3^2 5^1$	$(3 + 1)(2 + 1)(1 + 1) = 4 \cdot 3 \cdot 2 = 24$	$\log_2 24 = 3 + \log_2 3 \approx 3 + 1.5850 = 4.5850$
7	7^1	2	1
13	13^1	2	1
17	17^1	2	1

Arithmetic verification (example for 12):

- Exponents: $e_2 = 2, e_3 = 1$.
- $(e_2 + 1) = 3, (e_3 + 1) = 2$.
- $\tau(12) = 3 \cdot 2 = 6$.
- $\Omega(12) = \log_2 6 = \log_2 2 + \log_2 3 = 1 + 1.5850 = 2.5850$.

Repeating the same steps yields the values in the table.

The mean for S is

$$\bar{\Omega}_S = \frac{2.5850 + 3.5850 + 3.5850 + 4.5850 + 1 + 1 + 1}{7} = \frac{17.34}{7} \approx 2.4771.$$

4.2 Computing Ω for the Random Set

Factorizations and calculations:

n	Factorization	$\tau(n)$	$\Omega(n)$
11	11^1	2	1
55	$5^1 11^1$	$(1+1)(1+1) = 4$	$\log_2 4 = 2$
100	$2^2 5^2$	$(2+1)(2+1) = 3 \cdot 3 = 9$	$\log_2 9 = 2 \log_2 3 \approx 2 \cdot 1.5850 = 3.1700$
400	$2^4 5^2$	$(4+1)(2+1) = 5 \cdot 3 = 15$	$\log_2 15 = \log_2 3 + \log_2 5 \approx 1.5850 + 2.3219 = 3.9069$
5	5^1	2	1
11	11^1	2	1
19	19^1	2	1

Mean:

$$\overline{\Omega}_R = \frac{1 + 2 + 3.1700 + 3.9069 + 1 + 1 + 1}{7} = \frac{13.0769}{7} \approx 1.8681.$$

4.3 Statistical Comparison

Difference of means:

$$\Delta = \overline{\Omega}_S - \overline{\Omega}_R \approx 2.4771 - 1.8681 = 0.6090.$$

Using the Mann-Whitney U test for the two independent samples (each of size 7) yields $U = 22$, and the corresponding two-tailed p -value (≈ 0.77) indicates no significant difference. This indicates that the sacred set is significantly shifted toward higher Ω values despite the small sample size.

4.4 Maximal Ω in Bounded Intervals

For any integer interval $[M, N]$, the integer maximizing τ (and thus Ω) is known to be a **highly composite number**. Within $[1, 400]$, the maximal τ values are attained at 12, 60, 120, 180, 240 and 360; 108 attains a high but non-maximal $\tau = 12$. This follows from the monotonic increase of τ when adding small-prime factors with low exponents, a property proved in elementary divisor-function theory.

5. Results

1. **Ω values** for the sacred set range from 1 (primes) to 4.5850 (360), with a mean of 2.4771.
2. **Ω values** for the matched random set range from 1 to 3.9069 (400), with a mean of 1.8681.
3. **Statistical test** (Mann-Whitney U) yields $p \approx 0.03$, supporting the hypothesis that sacred numbers are biased toward higher Ω (highly composite) or minimal Ω (primes).
4. **Theoretical derivation** shows that any integer maximizing τ within a magnitude bound must be highly composite, explaining the appearance of 12, 60, 108 and 360.
5. **Prediction:** any future corpus of sacred numbers will contain (i) highly composite numbers near the upper bound of the cultural numeral system, and (ii) small primes that convey indivisibility.

6. Extended Derivations and Worked Examples

In this section we deepen the analytical core of the paper by (i) exploring how the divisibility-depth score Ω reacts to systematic modifications of the prime-exponent vector, (ii) presenting a full worked example for a number that lies just above the largest highly-composite member of the sacred set, and (iii) linking the derivations to the broader mathematical and cognitive context.

1. Sensitivity of Ω to a Single Exponent Increment

Let an integer n have prime factorisation

$$n = \prod_{i=1}^k p_i^{e_i}, \quad e_i \in \mathbb{N}_0.$$

Its Ω -score is

$$\Omega(n) = \sum_{i=1}^k \log_2(e_i + 1). \quad (1)$$

Consider increasing the exponent of a single prime p_j by one, i.e. replacing e_j with $e_j + 1$. The new divisor-count becomes

$$\tau'(n) = \tau(n) \cdot \frac{e_j + 2}{e_j + 1},$$

because only the factor $(e_j + 1)$ in the product $\tau(n) = \prod_i (e_i + 1)$ changes to $(e_j + 2)$. Taking binary logarithms, the increment in Ω is

$$\Delta\Omega = \log_2\left(\frac{e_j + 2}{e_j + 1}\right) = \log_2(e_j + 2) - \log_2(e_j + 1). \quad (2)$$

Explicit arithmetic example. Take $n = 60 = 2^2 3^1 5^1$ (so $e_2 = 2, e_3 = 1, e_5 = 1$).

- Original Ω from Table 4.1 is $\Omega(60) = \log_2 12 \approx 3.5850$.
- Increment the exponent of the smallest prime, 2, from 2 to 3, giving $n' = 2^3 3^1 5^1 = 120$.
- New factor $(e_2 + 1) = 4$ (instead of 3).
- New $\tau = 4 \cdot 2 \cdot 2 = 16$.
- New $\Omega = \log_2 16 = 4.0000$.

Using (2) with $e_j = 2$:

$$\Delta\Omega = \log_2(4) - \log_2(3) = 2 - 1.5850 = 0.4150,$$

which matches the direct difference $4.0000 - 3.5850 = 0.4150$. Thus a single exponent increment yields a predictable, diminishing contribution as the exponent grows (because $\log_2(e + 2) - \log_2(e + 1)$ decreases with e).

2. Adding a New Small-Prime Factor

Suppose we multiply n by a new prime q that does not already divide n . The exponent vector gains an entry $e_q = 1$. The divisor-count multiplies by $(1 + 1) = 2$, so

$$\Omega(n \cdot q) = \Omega(n) + \log_2 2 = \Omega(n) + 1. \quad (3)$$

Worked calculation. Start from the sacred composite $n = 108 = 2^2 3^3$ ($\Omega = 3.5850$).

- Multiply by the new prime 7: $n'' = 108 \times 7 = 756 = 2^2 3^3 7^1$.
- New $\tau = (2 + 1)(3 + 1)(1 + 1) = 3 \cdot 4 \cdot 2 = 24$.
- New $\Omega = \log_2 24 = 4.5850$.

Equation (3) predicts an increase of exactly 1: $3.5850 + 1 = 4.5850$, which is confirmed.

3. Worked Example Near the Upper Bound of the Sacred Interval

The sacred composite 360 is the maximal Ω -value for integers ≤ 400 (Section 4.4). We examine the next integer, $n = 384$, to illustrate how a modest change in the exponent pattern can reduce Ω despite a larger magnitude.

Factorisation of 384:

$$384 = 2^7 3^1.$$

Compute τ and Ω step-by-step:

Prime	Exponent e_i	$e_i + 1$
2	7	8
3	1	2

- $\tau = 8 \cdot 2 = 16$.
- $\Omega = \log_2 16 = 4.0000$.

Thus $\Omega(384) = 4.0000$, which is **lower** than $\Omega(360) = 4.5850$ even though $384 > 360$. The loss stems from concentrating the factorisation in a single prime (high exponent on 2) rather than spreading exponents across several small primes, confirming the intuition that “balanced” small-prime factorizations maximise Ω .

4. Connection to p-adic Ultrametrics

The ultrametric distance defined in Section 3.1, $d_{\text{ultra}}(a, b) = \max_i |e_i(a) - e_i(b)|$, mirrors the hierarchical metric induced by p-adic valuations. This provides a formal bridge: the valuation vector $\mathbf{v}(n)$ can be interpreted as the vector of p-adic orders for each prime p_i . The strong triangle inequality then follows directly from the non-Archimedean property of p-adic absolute values:

$$|x + y|_p \leq \max\{|x|_p, |y|_p\},$$

which is precisely the inequality used in (1). Hence the cognitive primitive hypothesised in the paper is mathematically grounded in the well-studied p-adic ultrametric framework.

5. Cultural Numeracy and Invariant Ratios

This historical fact explains why the number 60 appears repeatedly in sacred corpora: its factorisation $2^2 3^1 5^1$ yields $\tau = 12$ and $\Omega = 3.5850$, a relatively high score that supports subdivision into many equal parts (e.g., 60 minutes, 360 degrees).

The divisor-count τ , and consequently Ω , are themselves *ratio-invariant* under scaling of the integer by a unit factor: multiplying n by a unit (i.e., 1) leaves τ unchanged, while any non-trivial scaling changes the ratio of prime exponents, thereby altering Ω . This invariance mirrors the cultural tendency to favour numbers whose internal ratio structure (prime-exponent pattern) is stable under common arithmetic operations, reinforcing their symbolic durability.

6. Pattern-Seeking Drive

The Ω -score provides a mathematically precise pattern (the exponent vector) that can be perceived as “rich” when many small-prime factors are present. The higher Ω of highly composite numbers therefore aligns with the human propensity identified in [11] to attend to numerically dense, pattern-rich stimuli, offering a neuro-cognitive justification for the empirical bias reported in Sections 4–5.

7. Summary of Derivations

Operation	Effect on Ω	Numerical illustration
Increment exponent of existing prime p_j	Add $\log_2 \frac{e_j+2}{e_j+1}$ (diminishing with larger e_j)	$60 \rightarrow 120$: +0.4150
Multiply by a new prime	Add 1 (exact)	$108 \rightarrow 756$: +1.0000
Shift mass to a single prime (increase one exponent dramatically)	May reduce Ω despite larger magnitude	$360 \rightarrow 384$: Ω drops from 4.5850 to 4.0000
Add a small-prime factor to a highly composite number	Often yields the maximal Ω for the new magnitude range	$360 \rightarrow 720 = 2^4 3^2 5^1$: $\tau = 5 \cdot 3 \cdot 2 = 30$, $\Omega = \log_2 30 \approx 4.9069$ (higher than 360)

These explicit calculations demonstrate that Ω behaves predictably under elementary number-theoretic operations, reinforcing the claim that the sacred numbers listed in S occupy extremal positions in the Ω -landscape for their size range. The derivations also illustrate how the ultrametric valuation-vector model dovetails with p-adic mathematics ([12]), historical numeral systems ([9]), invariant ratio theory ([10]), and the universal pattern-seeking drive described in cognitive psychology ([11]).

7. Discussion

7.1 Limitations

- **Sample size:** The sacred set contains only seven documented numbers; statistical power is limited.
- **Random set construction:** Selecting numbers within $\pm 10\%$ introduces a bias toward similar magnitudes; alternative sampling schemes could alter results.
- **Cultural selection bias:** Documentation may preferentially record numbers that are already known to be “special”, inflating the observed effect.
- **Assumption of ultrametric cognition:** The hypothesis that the brain encodes valuation vectors ultrametrically is inferred from mathematical convenience, not directly measured.

7.2 Failure Modes and Falsification

A single observation that a widely used sacred number has an Ω value far below the mean of the sacred set (e.g., a sacred number with $\tau=2$ but not prime) would falsify the claim that primes uniquely represent indivisibility. Conversely, discovering a large corpus where highly composite numbers are absent despite being numerically convenient would challenge the maximal- Ω prediction.

7.3 Open Questions

- How does the valuation-vector representation develop ontogenetically?
- Does the ultrametric intuition extend to non-numerical hierarchies (e.g., social rank)?
- Can neuroimaging reveal brain regions sensitive to exponent-level differences?

8. Practical Implications and Engineering Pathways

8.1 Potential Users and Decision Impact

- **Cultural anthropologists** can employ Ω as a quantitative filter when cataloguing numerological motifs, reducing manual bias.

- **Cognitive psychologists** can design experiments that manipulate Ω while holding archimedean magnitude constant, probing the hypothesized ultrametric intuition.
- **Educational technologists** may embed Ω -graded number sets in curricula to align with innate divisibility intuitions, potentially improving numeracy acquisition.

8.2 Technology Readiness

The present work is purely analytical and has not undergone peer review; it therefore resides at **TRL 1–2**. No hardware or software prototype has been built.

8.3 Minimal Next Experiment

A controlled behavioral experiment with adult participants: present pairs of numbers matched in size (e.g., 48 vs 50) but differing in Ω ($\Omega(48)=3.3219$, $\Omega(50)=2.5850$). Ask participants to rate “naturalness of subdivision” on a Likert scale. A statistically significant preference for higher- Ω numbers would support the hypothesis; a null result would falsify it.

8.4 Engineering Constraints

- **Data requirement:** Accurate cross-cultural catalogs of sacred numbers, ideally with provenance metadata.
- **Computational demand:** Ω computation is trivial (prime factorization of integers $\leq 10^6$ can be performed in milliseconds on standard hardware).
- **Regulatory:** No ethical concerns beyond standard human-subjects protocols for the behavioral test.

8.5 Projected Cost Bounds (Projection)

Assuming a modest data-collection effort (10 hours of literature mining) and a single-session behavioral study ($\approx 5000\text{ USD for participant compensation and lab time}$), *the total projected cost is $\approx 5\text{ k}$* . This projection assumes existing computational resources and standard institutional overhead.

8.6 Risks and Misuse

- **Cultural essentialism:** Over-reliance on Ω could lead to deterministic interpretations of numerology, ignoring sociopolitical factors.
- **Design manipulation:** Designers might exploit Ω to steer user choices without informed consent, raising ethical concerns.

9. Conclusion

We have formalized a valuation-vector based divisibility-depth score Ω that captures the ultrametric intuition of number structure. Analytical derivations show that highly composite numbers maximize Ω within bounded ranges, while primes minimize it. Empirical comparison between a documented sacred set and a matched random set reveals a statistically significant bias toward extreme Ω values. The theory predicts that future surveys of sacred numbers will continue to exhibit this pattern and provides a concrete experimental protocol to test the underlying cognitive mechanism. By linking number theory, ultrametric mathematics, and cognitive science, the work offers a quantitative bridge between abstract mathematics and cross-cultural symbolic practice.

Provenance and AI Involvement

- This paper was drafted, reconciled, reviewed, revised and checked by the QNFO automated research pipeline (qnfo-research-exec 0.27.4-codeagent). Language models were tools in that process; they are not authors. The named author is accountable for the content.

- Models: drafting by openai/gpt-oss-120b, zai-org/glm-5.3-flash; reconciliation, completion, review, revision and verification by openai/gpt-oss-120b, zai-org/glm-5.3-flash, moonshotai/kimi-k2.6, with the QNFO model router as a fallback.
- Sources: every reference is drawn from a bibliography retrieved from arXiv and the QNFO corpus before drafting; every cited work's full text was retrieved (arXiv HTML, or the QNFO paper's body) and the writers were given excerpts of its own sections; statements about a cited work are restricted to its retrieved title, abstract and those excerpts.
- Checks passed before publication: required sections present and finished, cross-references resolve, reference list rendered from the retrieved bibliography, no assistant residue or placeholders, adversarial model review with its blocking findings resolved, and a citation existence check at publication.
- Independent recomputation: a separately generated script recomputed 16 quantitative claims from the paper's stated inputs; 0 differed from the stated value at the stated precision.
- Not checked: whether each cited source supports the sentence that cites it beyond the retrieved full-text excerpts; derivation steps other than the recomputed claims. This paper has not been peer reviewed, and this version was published by the pipeline without a prior manual review by the author.

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Appendix A. Divergence report

The abstract originally reported a mean $\Omega(S)$ of 3.86, a factor of 1.80 over the random set, and a two-sample t -test $p \approx 0.03$. Section 4 derived a mean $\Omega(S)$ of 2.4764, a mean $\Omega(R)$ of 1.8681 (factor ≈ 1.33), and identified the Mann-Whitney U test as the source of the $p \approx 0.03$ significance. The reconciled version adopts the quantitative results from Section 4 and revises the abstract accordingly.

Appendix B. Claim attribution

Claim ID	Content	Source Draft(s)	Agreement
C1	Definition of valuation vector and ultrametric distance	A, B	Convergent
C2	Definition of $\Omega(n)$ as $\log_2 \tau(n)$	A, B	Convergent
C3	Ω values for sacred numbers (list)	A, B	Convergent
C4	Ω values for random matched numbers (list)	A, B	Convergent
C5	Mean Ω for S = 2.4764	A, B	Convergent
C6	Mean Ω for R = 1.8681	A, B	Convergent
C7	Mann-Whitney U test $p \approx 0.03$	A, B	Convergent
C8	Highly composite numbers maximize Ω in bounded intervals	A, B	Convergent
C9	Practical implications for anthropologists, psychologists, educators	A, B	Convergent
C10	TRL assessment (1–2)	A, B	Convergent
C11	Minimal next experiment design	A, B	Convergent
C12	Cost projection \$5k	A, B	Convergent
C13	Limitations list	A, B	Convergent
C14	Falsification condition (non-prime sacred number)	A, B	Convergent