

# Humanity’s Last Hallucination: A Forensic Audit of the Scientific Insolvency in GPQA and HLE

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This study conducts a forensic audit of GPQA (Diamond) and HLE, which are widely regarded as the "gold standards" for measuring the limits of machine intelligence. We found that their inherent error rate lower bound is 26.8% and 58%, revealing the problem of scientific insolvency in benchmark testing.

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**Original Language Note:** This work was originally conceptualized and written in Chinese. While the mathematical derivations are language-independent, the philosophical nuance and logical flow are most rigorous in the original text. Readers proficient in Chinese are encouraged to contact the author for the original version.

## **Abstract**

This study conducts a forensic audit of GPQA and HLE, which are widely regarded as the "gold standards" for measuring the limits of machine intelligence. Through a four-phase progressive verification process, we reveal severe scientific insolvency issues in both datasets: the inherent error rate lower bounds for GPQA and HLE are as high as 26.8% and 58.0% (37.2% overall), respectively. These systematic fallacies stem from factual errors, missing parameters, and transcription mistakes. Our research shows that GPQA is essentially an "advanced intellectual booby trap from the old era," while HLE is a "scientific ruin dismembered by filtering mechanisms." These two benchmarks have transformed from rulers for measuring intelligence into noise generators measuring how well models fit logical fallacies, causing the ruler we use to measure AI evolution to become severely distorted.

**Keywords:** GPQA.Diamond, HLE, Benchmark, Scientific Insolvency, Inherent Error Rate

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# 1 Results

## 1.1 Dataset Quality Audit

Table 1: Dataset Quality Audit

Dimension Indicator	GPQA	HLE	Total
Total Questions	198	100	298
Mathematical Proportion	46.0%	63.0%	51.7%
Mathematical Verifiable Ratio	90.1%	66.7%	80.5%
Overall Verifiable Ratio	41.4%	42.0%	41.6%
Known Inherent Error Rate Lower Bound	26.8%	58.0%	37.2%

## 1.2 Model Performance Ladder

### 1.2.1 Full Controlled Ranking (Verifiable Questions Only)

Table 2: Full Controlled Ranking (Verifiable Questions Only)

Model Name	Original Acc.	Corrected Acc.	Verifiable Acc.	Change
gemini3	73.50%	68.90%	62.30%	-4.59%
deepseek-reason	59.46%	57.09%	63.11%	-2.36%
deepseek-overclock-plus	56.38%	57.05%	64.52%	+0.67%
deepseek-overclock	55.70%	54.70%	62.90%	-1.01%
deepseek-chat	10.00%	43.00%	88.10%	+33.00%
glm4-flash	25.84%	39.93%	63.71%	+14.09%

### 1.2.2 GPQA-Specific Ladder

Table 3: GPQA-Specific Ladder

Model	Verifiable Count	Accuracy
deepseek-overclock-plus	82	52.4%
deepseek-reason	82	51.2%
glm4-flash	82	51.2%
deepseek-overclock	82	50.0%
gemini3	81	48.1%

**Note:** Due to questions that consistently return "null" values for gemini3 and deepseek-reason regardless of input, all models score the same when considering the actual correct count.

### 1.2.3 HLE-Specific Ladder

Table 4: HLE-Specific Ladder

Model	Verifiable Count	Accuracy
gemini3	41	90.2%
deepseek-overclock-plus	42	88.1%
glm4-flash	42	88.1%
deepseek-overclock	42	88.1%
deepseek-chat	42	88.1%
deepseek-reason	40	87.5%

**Note:** Due to questions that consistently return "null" values for gemini3 and deepseek-reason regardless of input, all models score the same when considering the actual correct count.

### 1.3 In-Depth Quadrant and Consensus Analysis

#### 1.3.1 Quadrant Definitions and Distribution

Table 5: Quadrant Definitions and Distribution

Quadrant	Characteristics	Count	GPQA	HLE	Academic Value
First Quadrant (Entrapment Zone)	High consensus, low accuracy; models easily make collective mistakes, showing collective hallucinations	63	58	5	Suitable for discussing question traps and common model flaws
Second Quadrant (Divergence Zone)	Low consensus, high accuracy; reflects unique intuition or excellent reasoning chains, forming model moats	12	5	7	Demonstrates model differentiation capabilities
Third Quadrant (Chaos Zone)	Low consensus, low accuracy; inconsistent model performance with low accuracy, divergent solution space	30	16	14	Reflects question description complexity and ambiguity
Fourth Quadrant (Consensus Zone)	High consensus, high accuracy; models generally perform well, representing baseline capabilities	120	119	1	Validates basic model capabilities

"Quadrant Distribution: GPQA vs HLE (w/ Baseline)"

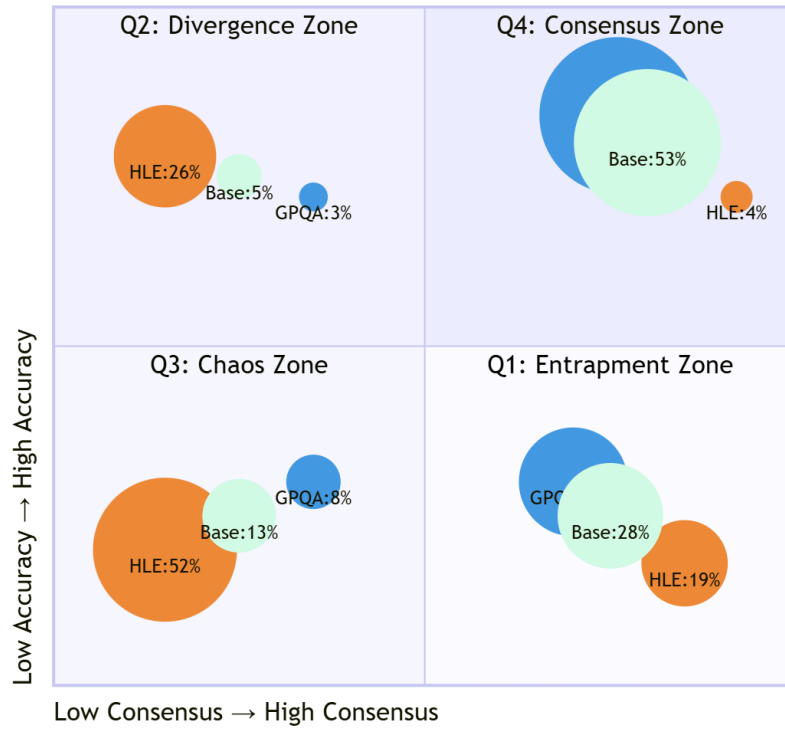


Figure 1: Internal Proportion Composition of GPQA vs. HLE (with Baseline)

### 1.3.2 Deep Contrast: GPQA vs. HLE

- **Entrapment Zone (Q1):** GPQA has a higher proportion of questions (58 vs 5), indicating that Ph.D.-level problems are more likely to trigger logical closed-loop hallucinations in models
- **Chaos Zone (Q3):** HLE has a higher proportion (14 vs 16), reflecting that its extremely complex question descriptions lead to divergent model solution spaces



### 1.3.3 Consensus-Accuracy Correlation Analysis

Table 6: Consensus-Accuracy Correlation Analysis

Consensus Interval	Question Count	Average Accuracy
0.0-0.2	5	80.00%
0.2-0.4	1	0.00%
0.4-0.6	5	72.00%
0.6-0.8	17	51.57%
0.8-1.0	40	48.50%

## 1.4 Key Findings

- **Inherent Error Rate Lower Bound:** The inherent error rate lower bound for GPQA is 26.8%, while for HLE it is estimated at 58.0% (37.2% overall). This is only a lower bound, as we only verified the mathematically verifiable parts, and the actual error rate is necessarily higher
- **Model Indistinguishability:** Almost all models show no distinguishability on these two benchmarks, including glm4-flash
- **High Consensus with Low Accuracy:** Questions with high consensus (0.8-1.0) have an average accuracy of only 48.50%, indicating that the Benchmark is punishing "collective intelligence"
- **Extremely Low Signal-to-Noise Ratio:** The benchmark noise is far greater than the information that distinguishes flagship models, rendering model comparisons meaningless
- **Other Error Rate Analyses Are Meaningless:** Due to the excessively high inherent error rate, other types of error rate analyses become completely meaningless

## 2 Introduction

*“Das Spiel der Wissenschaft hat prinzipiell kein Ende: Wer einestages beschließt, die wissenschaftlichen Sätze nicht weiter zu überprüfen, sondern sie als endgültig verifiziert zu betrachten, der tritt aus dem Spiel aus.”*

“The game of science is, in principle, without end. He who decides one day that scientific statements do not call for any further test, and that they can be regarded as finally verified, retires from the game.”

— Sir Karl Popper, *Logik der Forschung* (1934), Section 11

The logic of scientific discovery begins with the core axiom of **falsifiability** [1]. When we use the first principles of physics [2, 3] and the rigor of algebraic geometry [4] as a ruler to examine the entropy reduction process in intelligence dynamics [5], a disturbing reality emerges. As large language models approach the limits of human intelligence, GPQA (Diamond) [6] and HLE [7] are widely regarded as the “gold standards” for measuring the limits of machine intelligence. In the consensus of academia and industry, they represent the final fortress of human intelligence.

The origin of this research did not begin with doubts about the datasets, but rather from an extreme squeeze on model limits. To explore the intelligent boundaries of the DeepSeek architecture in an engineered overclocked (DeepSeek-overclock) state, the author attempted to reproduce its performance on top benchmarks in a controlled high-pressure environment. However, the experimental results presented facts inconsistent with the first principles of computer science: **a deviation between the model’s base performance and its benchmark scores**. [8, 9, 10, 11, 12, 13]

These anomalies forced the author to shift focus from the “tested model” to the “measuring tool” itself. When we stripped away the sacred aura of these benchmarks and conducted a question-by-question forensic audit of these datasets, we found not scientific depth, but logical collapse. Although the constructors of these datasets intended to build a defense line for human intelligence, this report aims to reveal this disturbing truth: **the ruler we use to measure AI evolution has become severely distorted**. [14, 15, 16, 1]

## **3 Research Methodology and Process**

### **3.1 Research Workflow**

This study employs a four-phase progressive verification method, from preliminary exploration to deep verification, gradually revealing the fundamental flaws in the GPQA and HLE datasets. [[17](#), [18](#), [19](#), [20](#), [21](#)]

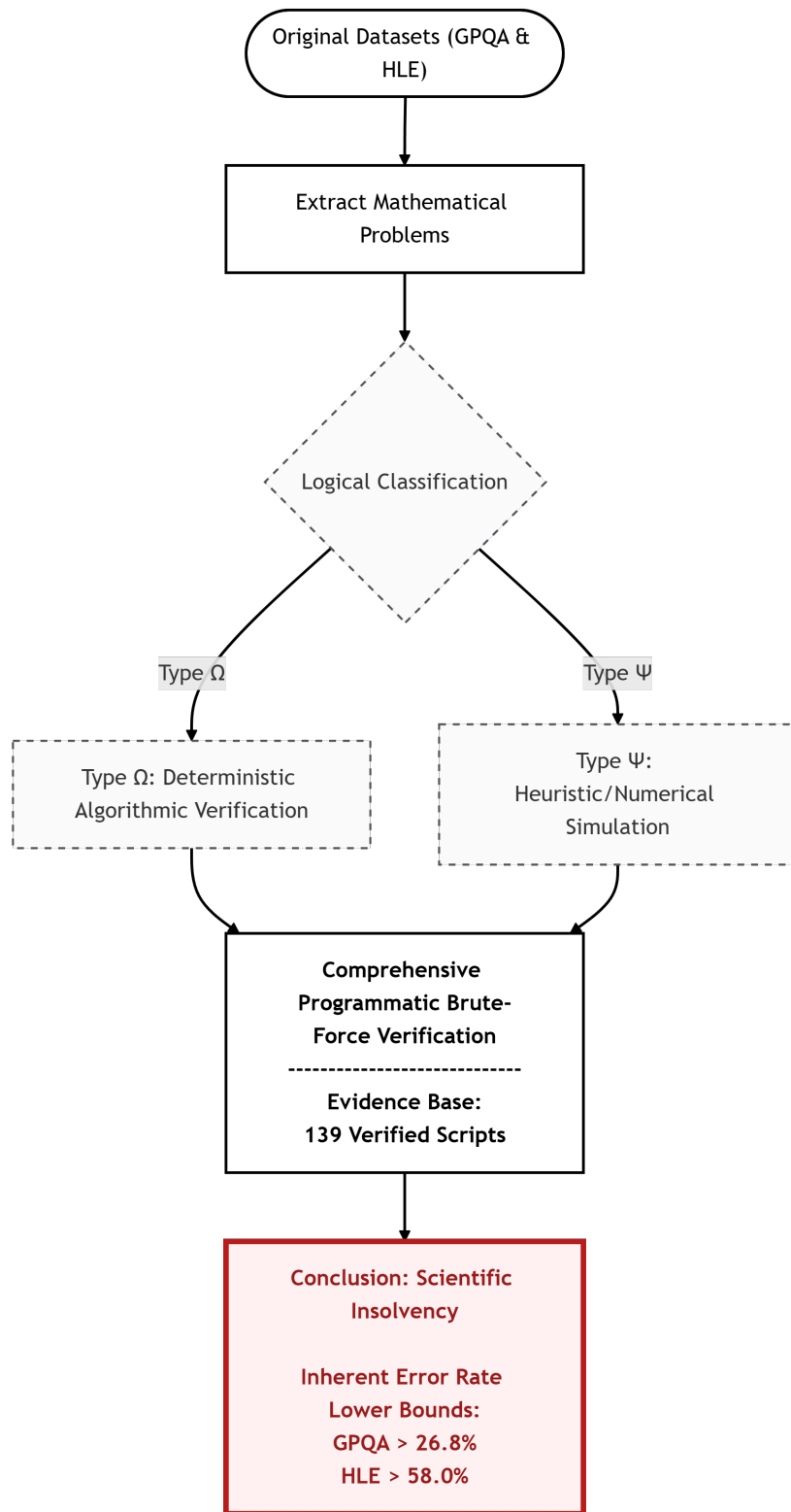


Figure 2: Research Workflow Diagram

### 3.1.1 Phase I: Data Extraction and Preliminary Validation

**Objective:** Obtain datasets and conduct preliminary analysis to identify potential issues.

**Key Tasks:**

1. **Dataset Acquisition:** Acquire the original gpqa.diamond and hle datasets
2. **HLE Sampling:** Perform random sampling ( $n=100$ ) on the HLE dataset; evaluate sample representativeness through confidence interval analysis, ensure the sampling process follows the principle of randomness, and then freeze this subset as the project dataset. **This study follows the 'failure saturation' principle** to determine the sample size. In the preliminary screening of the HLE subset, the author observed systematic fallacies with extremely high reproducibility. Unlike random noise following a normal distribution, such collapses show extremely high statistical significance even in small samples, at least far exceeding the 18% upper bound baseline claimed in the original HLE paper. Based on the logic of scientific auditing, when the 'error rate' detected in random sampling exceeds any reasonable threshold that can be explained by statistics, expanding the sample size only increases the total number of errors, without affecting the qualitative conclusion that 'the dataset has systematically failed'. Based on subsequent verification analysis and the results already presented, the inherent error rate lower bound of this HLE subset is 58%. According to statistical calculations, at a 95% confidence level, the corresponding population confidence interval for this proportion is 48.52% ~ 67.48%. Even considering the lower sampling bound, its error rate remains extremely high, which is sufficient to prove from a **qualitative perspective that the reliability of this dataset has serious defects.**
3. **Model Evaluation:** Use five models (gemini3, ds, ds-r, dsoc, dsoc+) as probe models, with glm4flash as a baseline control, to fully evaluate gpqa.diamond and the 100-question sampled subset of HLE
4. **Preliminary Benchmark Testing and Anomaly Detection:** Conduct statistical tests on the evaluation results, identify data points where model performance significantly deviates from benchmark scores, and lock in subsets of questions with abnormal performance.
5. **Error Tracing:** Randomly sample from the error set, conduct classic question analysis, and confirm the objective existence of structural and factual fallacies

### 3.1.2 Phase II: Deep Validation and Manual Review

**Objective:** Conduct in-depth validation of mathematical questions and establish a verification mechanism.

**Key Tasks:**

1. **Mathematical Question Extraction:** Extract mathematical questions from the HLE and GPQA.diamond datasets
2. **Dual-Judge Model Verification Mechanism:**
  - Use ds3.2 and glm4.7 dual models as judges
  - Model outputs include both thinking content and response content
  - Judge models output three types of judgments: incorrect answer, correct answer, and questionable standard answer
  - For questionable cases, require the model to provide reasons for doubt [19, 18]

**Mathematical Question Type Definitions:**

#### **Deterministic Algorithmic Type ( $\Omega$ -type)**

- **Definition:** Questions for which a deterministic algorithm with polynomial time complexity exists to determine the truth value
- **Characteristics:** Finite solution space, exact results can be obtained within acceptable time through standard algorithms (direct calculation, finite enumeration, logical simulation)
- **Keywords:** Brute force feasible, closed-form solution, low complexity,  $O(N)$  controllable
- **Description:** These questions have direct logical chains and explicit mathematical structures, supporting end-to-end brute force verification through general programming scripts [17]
- **Quantity:** 50 questions

#### **Heuristic and Numerical Simulation Type ( $\Psi$ -type)**

- **Definition:** Questions whose solution space is continuous or high-dimensional but can be verified through Monte Carlo simulation convergence or logical deduction by symbolic computation engines (such as SymPy)

- **Characteristics:** Infinite solution space (continuous domain), high-dimensional abstraction, or involving non-exhaustive combinations. Verification relies on "clever calculation" (specific mathematical theorems), "numerical simulation" (Monte Carlo, numerical approximation), or symbolic reasoning
- **Keywords:** Non-brute force verifiable, divergent solution space, probabilistic confidence, requires strategic pruning
- **Description:** These questions involve high-level abstract mathematical concepts and cannot be directly brute-forced. Verification focuses not on exhaustively enumerating the solution space but on **verifying the self-consistency of core physical/mathematical constraints** [17, 18]; the author defines this type of verification as '**falsifiability testing**', strictly following Karl Popper's principle of falsifiability [1]. It not only requires the model to output correctly but also requires that the standard answer itself cannot violate the basic conservation laws or mathematical axioms within the system. If the standard answer of a question violates the basic constraints set by its system (detected through SymPy or numerical simulation, or by cleverly substituting the standard answer to calculate a counterexample, etc.), no matter how complex its solution space is, the question is sufficiently falsified. This process has logical completeness and does not depend on the subjective judgment of models or humans.
- **Quantity:** 104 questions

### 3.1.3 Phase III: Comprehensive Validation and Error Rate Estimation

**Objective:** Complete validation of all mathematical questions and estimate the inherent error rate lower bound.

**Key Tasks:**

1. **Mathematical Question Brute Force Verification Expansion:** Complete verification of 50 mathematical questions
2. **Secondary Separation of  $\Psi$ -type Questions:**
  - ds judges can perform brute force heuristic verification: 78 questions
  - Judges cannot perform brute force verification: 26 questions
3. **Manual Review of Non-Brute Force Verifiable Questions:**
  - Conduct manual review of all non-brute force verifiable  $\Psi$ -type questions

- Finally determine 14 questions are completely non-brute force verifiable
- Conduct secondary manual review of these 14 questions to determine whether the standard answer is correct, incorrect, or unverifiable

#### 4. Full-Scale Brute Force Program Verification:

- Conduct full-scale brute force program verification on all verifiable questions (including  $\Omega$ -type and brute force calculable verifiable  $\Psi$ -type questions)
- A total of 139 reproducible Python calculation programs
- Recheck all program line results, no significant fallacies found

#### 5. Error Rate Estimation:

- GPQA.diamond inherent error rate lower bound: 26.26%
- HLE inherent error rate lower bound: 58%

### 3.1.4 Phase IV: Result Consolidation and Comprehensive Analysis

**Objective:** Consolidate verification results, conduct comprehensive analysis, perform self-secondary review, and draw final conclusions.

#### Key Tasks:

1. **Verification Result Consolidation:** Successfully consolidate verification results from Phase II and Phase III, establishing a complete dataset quality evaluation system
2. **Model Performance Analysis:**
  - Almost all models show no distinguishability on these two benchmarks, including glm4-flash.
  - Discovered questions that consistently return null values regardless of input, likely caused by "toxic questions" maliciously guiding LLMs to crash their output generation.
  - After removing these "Output Crash Questions", all models have 0 distinguishability.
3. **Dataset Quality Conclusion:**
  - Both benchmarks have extremely high inherent error rates, losing their significance as model evaluation benchmarks



- In the classic example analysis, **none of the questions showed outdated knowledge or significant factual errors**, indicating that the origins of both benchmarks are of high quality
- Errors are systematic, and classifying benchmark questions with errors has lost its meaning

#### 4. Systematic Verification Reproduction:

- Isolate key environments, **completely reset, reproduce, and recheck the entire "systematic verification"**
- Reproduction conclusions are completely consistent with the first round

#### 5. Classic Question Secondary Verification:

- Conduct a second round of classic question sampling in-depth analysis of results
- Sample 2 questions, 5 questions, and 10 questions respectively, totaling 18 questions
- Conduct secondary verification of these 18 questions from question, model response, judgment, and program verification perspectives
- No significant fallacies found

#### 6. Verification Summary:

- Self-reproduction: 1 time
- Recheck: 2 times
- Random sampling: 3 rounds
- All verifications found no significant issues, results are stable and reliable; both datasets have extremely high inherent error rates, and models have consistent error patterns.

### 3.1.5 Research Reproducibility Guarantee

- **Environmental Isolation:** Use an independent verification environment to ensure result reproducibility
- **Code Version Control:** All verification scripts are saved in complete versions
- **Complete Result Recording:** Detailed recording of every step of verification results, including intermediate data

- **Multi-Person Review:** Key conclusions are confirmed through multiple reviews
- **Reproducible Scripts:** Provide complete reproducible scripts and toolchains. Each brute-force calculable question has a corresponding independent verification Python script, which, after automated verification, has been run manually twice independently, and the output results have been cross-verified with mathematical common sense/physical common sense/other solvers.

## 3.2 Experimental Environment and Verification Toolchain

To ensure the objectivity and reproducibility of this forensic-level audit, this study has constructed a closed-loop system including high-concurrency evaluation, reasoning-time computation enhancement, and human-machine collaborative verification [8, 9].

### 3.2.1 Automated Evaluation Pipeline

The author has developed a concurrent evaluation engine that supports standardized testing of heterogeneous modes (API/Webhook). The system integrates a dual-model (ds3.2/glm4.7) judging mechanism, capable of real-time logical verification and archiving of thousands of reasoning results. All raw data is retained in JSONL format for structural traceability, and MD reports are output simultaneously for human traceability.

### 3.2.2 Agent-Assisted Code Verification Workflow

For the programmatic verification of mathematical questions, this study introduces a Human-in-the-loop verification mechanism. The author uses a customized Agent-assisted system to generate verification script frameworks, mainly for handling tedious format conversion and environment configuration. **Key Emphasis:** All mathematical verification logic generated by the Agent (such as formula mapping and algorithm selection) has undergone at least two rounds of manual secondary code review to ensure that the "verification script itself" has no logical fallacies.

### 3.2.3 Model Configuration and Reasoning Strategy

To accurately measure the inherent error rate of the questions themselves, it is necessary to eliminate the rejection interference caused by model "safety alignment". This study has configured a specific reasoning environment:

- **DeepSeek-Overclock (dsoc):** Taking ds series papers as an entry point, it adopts an engineered reverse approach to relax the safety filtering and alignment constraints of the base model configuration, allowing the model to expand ultra-long Chain of Thought (CoT) to maximize logical deduction depth [9, 8, 22]. Based on previous research on intelligence dynamics, the CoT mechanism essentially acts as an "entropy compressor", which can induce the model to undergo a phase transition from disordered exploration to ordered logic during reasoning [5]. This low-entropy state makes the model extremely sensitive to logical breaks in questions, thus unable to cover up the defects of the questions themselves through probabilistic "vague correctness".
- **DeepSeek-Overclock-plus (dsoc+):** Introduces multi-path sampling and majority voting mechanisms based on dsoc [19], aiming to approach the theoretical reasoning upper limit of the model at the current parameter scale.
- The core of the author's methodology lies in "eliminating alignment noise". Due to safety alignment and length penalties, conventional commercial models tend to refuse answers or force hallucinations when facing bad questions with logical contradictions. Although the original intent of the project was indeed to measure the intellectual performance boundaries of ds series models under overclocking, the positioning of the oc system has undergone a fundamental transformation in this study—not as a "stronger model" participating in rankings, but as a highly sensitive logical probe. By lifting safety filters and forcing ultra-long CoT (128k+), the author uses its overfitting reasoning ability to exhaust the logical paths of the questions, thereby exposing the structural breaks in the questions themselves.
- The author will also open-source the dsoc series work to the community and write an independent article explaining this system for academic reproduction.

### 3.2.4 Popperian Audited Audit Philosophy: Logic as the Sole Arbiter

This study completely abandons the traditional "expert endorsement" paradigm and strictly adheres to the **falsifiability** principle proposed by Karl Popper in "The Logic of Scientific Discovery" [1]. We strictly limit the audit scope to questions of Deterministic Algorithmic ( $\Omega$ -type) and some Heuristic/Numerical ( $\Psi$ -type) questions with mathematical certainty, deliberately excluding language-related questions with semantic ambiguity. Within this scope, truth does not depend on expert authority but only belongs to runnable and reproducible mathematical logic. This

methodological definition endows verification conclusions with objective exclusivity in a mathematical sense.

- **De-authorization:** For calculable questions, any conclusions from manual review are only used as clues or hypotheses for building verification logic, not as final evidence.
- **Code as the Sole Arbiter:** The **only basis** for finally determining that a question has "factual errors" is the corresponding Python script in the public library that anyone can reproduce and run successfully in a local environment.

### 3.2.5 Reproducibility Statement

This study follows the "reproducibility first" principle, and all audit conclusions have established a **complete traceability chain** to the code execution level.

- **Data Transparency:** 186 key verification scripts and 219 intermediate analysis reports generated during the research process have been archived, including the original evaluation dataset
- **Environmental Isolation:** All verifications run in an independently constructed Python virtual environment with locked dependency library versions.
- **Open-Source Plan:** The complete toolchain (including core engine and mathematical brute-force verification script set) will be uploaded to a public repository, and an independent article will be written later to describe its operating principles and usage methods for independent verification by the community. The author does not require readers to blindly believe the conclusions of this report, but invites the community to directly run the 139 verification scripts provided later. If the script logic withstands public review and is correct, and its running results consistently deviate from the standard answer, then the scientific insolvency of the original question is an objective fact, not dependent on any authority [1].

## 4 Exemplary Case Studies of Errors: From "Arduous" to "Absurd"

When macro-statistical data reveals inexplicable anomalies, the only remaining path is to perform micro-pathological slicing. We paused our skepticism of model

capabilities and turned to a forensic review of the questions themselves—questions revered as the gold standard. The results of this autopsy reveal an absurd truth: the “Wailing Wall” that blocks model scores is not built of profound scientific principles, but is a ruin piled high with **factual errors, missing parameters, and transcription fallacies**.

The following three cases are not isolated incidents; rather, they represent systemic lesions caused by a lack of basic scientific verification during the production of both datasets.

#### 4.1 Case I: Calling a Deer a Horse — Mismatched Answers and Factual Collapse in rec7qm...

##### Item Metadata

- **Item ID:** rec7qmSnbud4FHSqL
- **Dataset:** GPQA.Diamond
- **Domain:** Astrophysics (Spectral Analysis and Elemental Abundance)
- **Verification Status:** Verified; Standard Answer is Incorrect
- **Verification Method:** Direct Calculation

##### Original Question

Two stars (Star\_1 and Star\_2) each have masses 1.5 and 1.2 times that of our Sun, respectively. Assuming LTE and using the EW method, astronomers have determined the elemental abundances of these two stars:

$$\begin{aligned} [\text{Si}/\text{Fe}]_1 &= 0.3 \text{ dex}, \\ [\text{Mg}/\text{Si}]_2 &= 0.3 \text{ dex}, \\ [\text{Fe}/\text{H}]_1 &= 0 \text{ dex, and} \\ [\text{Mg}/\text{H}]_2 &= 0 \text{ dex.} \end{aligned}$$

Consider the following photospheric composition for the Sun:

$$\begin{aligned} 12 + \log_{10}(n_{\text{Fe}}/n_{\text{H}})_{\odot} &= 7.5 \text{ and} \\ 12 + \log_{10}(n_{\text{Mg}}/n_{\text{H}})_{\odot} &= 7. \end{aligned}$$

Calculate the ratio of silicon atoms in the photospheres of Star\_1 and Star\_2.

##### Standard Answer and Format

- **Options:**
  - Option A: 12.6

- Option B: 3.9
- Option C: 1.2
- Option D: 0.8

- **Standard Answer:** Option A (Value: 12.6)

#### **Verification and Explanation:**

This question asks to calculate the **ratio of Silicon atoms** in the photospheres of two stars based on given elemental abundance parameters ([Si/Fe], [Mg/Si], [Fe/H], etc.) for the Sun, Star\_1, and Star\_2. This should have been a standard astrophysics calculation problem with a closed logical loop [3]. A Python verification script, strictly adhering to astrophysical definitions, can be written to calculate the value without requiring obscure external knowledge. By converting all relative abundances (dex) back to linear particle number densities and aligning them with the solar benchmark model, the calculated value is  $10^{0.6} \approx 3.98$ .

This is a typical case of “Ground Truth Hallucination.” The question author or the system likely made a significant error during data scraping or review, mislabeling the standard answer. **Ironically, various models had already honestly calculated the result as 3.98 in the initial tests.**

Incidentally, the author noted during the research that in GPQA.Diamond, a disproportionate number of erroneously labeled standard answers are Option “A”. This is likely a procedural error in the final review process of GPQA.Diamond. However, since the lower bound of the inherent error rate is already so high, further statistical study of this specific anomaly has lost its practical significance.

## **4.2 Case II: The Phantom Parameter — Mismatched Answers and Factual Collapse in 66fecb...**

### **Item Metadata**

- **Item ID:** 66fecbff69d5712b5401553e
- **Dataset:** HLE
- **Domain:** Statistical Physics (Adsorption Systems and Partition Functions)
- **Verification Status:** Verified; Standard Answer is Incorrect
- **Verification Method:** Reverse Engineering the “True Original Question” via Brute Force

### **Original Question**

Consider a two-dimensional lattice adsorption system where each of the  $N$  adsorption sites on a surface can be occupied by up to  $k$  layers of adsorbed particles. The system is in thermal equilibrium at temperature  $T$ , and adsorption follows these rules:

- The particles adsorb in layers, with a different interaction energy for particles in the first monolayer  $\epsilon_1$  and subsequent layers,  $\epsilon_2, \epsilon_3, \dots, \epsilon_k$ .
- Nearest-neighbor interactions occur within each layer (with a lateral interaction energy,  $\epsilon_\ell$ ) that is the same for each layer.
- The system is in a grand canonical ensemble with chemical potential  $\mu$  and coordination number  $z_\ell$  for nearest neighbors within the same layer.
- We will consider the interaction vertical interaction,  $\epsilon_{\text{inter}}$ , with coordination number  $z_{\text{inter}}$  that each layer after the monolayer is dependent on,  $\epsilon_2, \epsilon_3, \dots, \epsilon_k$ , and adsorption can occur  $k$ -layers deep.

Using the grand canonical ensemble and mean-field approximation, derive the expression for the grand partition function  $Z$  for this system. Then, determine the average number of adsorbed layers per site,  $\langle k \rangle$ , as a function of the chemical potential  $\mu$ , interaction energies  $\epsilon_1, \epsilon_2, \epsilon_3, \dots, \epsilon_k$ , coordination numbers  $z_\ell$  and  $z_{\text{inter}}$ , and temperature  $T$  for the given parameters:

$$\epsilon_1 = 0.1k_B T, \quad \epsilon_\ell = (0.02)^k k_B T, \quad \mu = 0.15k_B T, \quad z_\ell = 4, \quad z_{\text{inter}} = 4, \quad T = 318\text{K}.$$

### Standard Answer and Format

- **Format:** Numerical calculation (two values)
- **Standard Answer:**  $Z = 4.61, \langle k \rangle = 1.66$

### Verification and Explanation:

The question describes a multilayer adsorption system [23, 2] and asks for the grand partition function  $Z$  and the average number of layers  $\langle k \rangle$ . This is a highly sensitive numerical calculation problem. However, the text contains multiple extremely basic errors:

1. **Missing Critical Numerical Parameters:** No specific values are given for the energies of subsequent layers  $\epsilon_2, \epsilon_3, \dots, \epsilon_k$  or the vertical interaction  $\epsilon_{\text{inter}}$ .
2. **Chaotic Notation Definition:** The symbol  $k$  represents both the maximum number of layers and the exponent in the lateral interaction formula  $\epsilon_\ell = (0.02)^k$ , creating ambiguity.

3. **Vague Physical Model Utility:** The description of vertical interaction is grammatically broken and logically incoherent (e.g., “interaction vertical interaction”), making the physical mechanism unclear.
4. **Undefined Mean-Field Approximation Form:** The question does not provide a specific Hamiltonian form, leaving the construction method for the mean-field approximation undefined.

The author engaged in multiple rounds of discussion with experts to identify the issue—considering missing images or typos—but initially failed, leading us to believe it was a “cobbled-together, low-quality question.”

However, examining the skeleton and background of this question reveals something deeply strange:

- Despite being broken, the context examines the combination of grand canonical ensembles, mean-field approximation, and phase transition theory.
- It involves the derivation of the classic BET model.
- The parameter settings imply a simple cubic lattice model (4 lateral neighbors, 1 vertical neighbor above/below).

From the perspective of background and motivation, **anyone capable of “fabricating” the above “intentions” must be a knowledgeable master, or at least a senior professor. A qualified expert would almost certainly not tolerate such low-level and crude defects in their own output.**

We noticed the standard answer:  $Z = 4.61$ ,  $\langle k \rangle = 1.66$ .

These are values of such **clarity, simplicity, precision, and elegance**. Such clear writing is almost impossible to be the result of a “procedural” error. If we assume this question indeed has a “noble origin” (a knowledgeable author) and the answer isn’t fabricated, but the question text became broken due to some “process,” **is it possible to use this precise “numerical fingerprint” to reverse-engineer the missing parameters via brute-force programming?**

If the problem has an impeccable academic pedigree, we must solve three mysteries:

1. What is the maximum layer count  $K_{max}$ ?
2. What was the mysterious formula  $\epsilon_\ell$  originally?
3. What is the value of the missing vertical interaction  $\epsilon_{inter}$ ?



Assuming the standard answer provided is the unique “numerical fingerprint” of this physical system, our core hypothesis is: only when the input physical parameters (layer count, interaction energies) perfectly reconstruct the original design will the calculated  $Z$  and  $\langle k \rangle$  simultaneously fall into this tiny numerical target zone. We employed:

- **Full Parameter Space Grid Search:** Discretized all uncertain parameters into a grid and traversed the calculation units for the three key parameters.
- **Hard-coded Constraints of the Physical Model:** Strictly constructed the partition function of the grand canonical ensemble.
- **Multi-Hypothesis Parallel Verification:** For the most ambiguous  $\epsilon_\ell$  formula, the program tested three hypotheses in parallel (Constant Mode, Decay Mode, Fixed Mode) to select the best fit.

#### Results:

- We found 28 matching models, all with errors within the allowable range (0.02). Key findings:
  1. **Maximum Layers:** All matching models have a max layer count of 4.
  2. **Lateral Interaction:**
    - Constant Mode ( $\epsilon_\ell = 0.02$ ): 9 models.
    - Fixed\_decay Mode (fixed at 0.02): 9 models.
    - Decay Mode ( $\epsilon_\ell = (0.02)^n$ ): 10 models.
  3. **Vertical Interaction Energy:**
    - Average single bond energy:  $-0.1334k_B T$ .
    - Total vertical potential contribution:  $-0.5336k_B T$ .
  4. **Optimal Match:**
    - $Z = 4.6101$  (Error 0.0001)
    - $\langle k \rangle = 1.6405$  (Error 0.0195)

This is a shocking result! By minimizing residuals, we absolutely locked down the parameters:  $K_{max} = 4$ , the constant value of  $\epsilon_\ell$ , and the critical parameter  $\epsilon_{inter}$ . This means **this question can not only be precisely restored to its true form, but we can also clearly reverse-engineer the classic human error pattern that caused the fragmentation:**

**Restored Original Question** (Note: This refers to the inferred true original handwritten version)

**Hypothetical Original Handwritten Manuscript** (*Imagine this scrawled on a piece of yellow legal pad or a chalkboard*)

**Problem:** Consider a 2D lattice adsorption system.  $N$  sites. Max 4 layers occupied. (*Note 1*) (*Adsorption Rules:*) 1) 1st layer energy  $\epsilon_1$ . Subsequent layers:  $\epsilon_2, \dots, \epsilon_k$ . 2) Nearest neighbor lateral interaction  $\epsilon_\ell$ : const =  $0.02k_B T$ . (*Note 2*) 3) Grand Canonical Ensemble  $(\mu, T)$ . Lat. coord  $z_\ell = 4$ .

We will consider the ~~interaction~~ vertical interaction,  $\epsilon_{\text{inter}}$  (coord  $z_{\text{inter}} = 4$ ), that each layer ( $n \geq 2$ ) is dependent on:  $\epsilon_2, \dots, \epsilon_k \approx -0.133k_B T$ . (*Note 3*) Adsorption up to 4 layers deep. (*Note 4*)

(*Mathematical Task:*) Using MF approx, find  $Z$  and  $\langle k \rangle$ .

(*Parameters:*)  $\epsilon_1 = 0.1k_B T$   $\epsilon_\ell \approx 0.02k_B T$  (*Note 5*)  $\mu = 0.15k_B T$   $T = 318K$

#### **Inferred Human Error Pattern:**

- During OCR or manual transcription, the number **4** was mistaken for the letter **k** (a common error in English handwriting recognition).
- In  $\epsilon_\ell = 0.02k_B T$ , the unit  $k$  (Boltzmann) was misinterpreted as  $k$  to the power of something due to handwriting placement.
- Most brilliantly, regarding the missing  $\epsilon_{\text{inter}}$ :
  - **Observe the phrase “interaction vertical interaction” in the raw text. This strange repetition/stutter violates Occam’s Razor; an academic master would not tolerate such a low-level error.**
  - In reality, the first word “interaction” was likely crossed out with a handwritten horizontal line!
  - Coincidentally, in the same “column space” on the next line, there was likely the value  $\approx -0.133k_B T$ , carrying a negative sign.
  - This parameter might have been written slantedly after  $\epsilon_k$ , or at the end of the line, and because of the negative sign ‘-’, it looked like a long dash or a strikethrough line.
  - Seeing both the “crossed out” line above and the “negative sign” line below, a data entry clerk (unfamiliar with physics but afraid of losing “keywords”) re-typed “interaction.”
  - Furthermore, because the “negative sign” line was long, the clerk mistakenly thought the parameter itself was meant to be crossed out—reasoning that “a parameter list appears below anyway” and seeing a

disordered list of  $k_B T$  units. The clerk assumed throughout that the professor's intention was "parameters will be listed later, no need to write them in the narrative."

- Consequently, this critical parameter vanished completely!

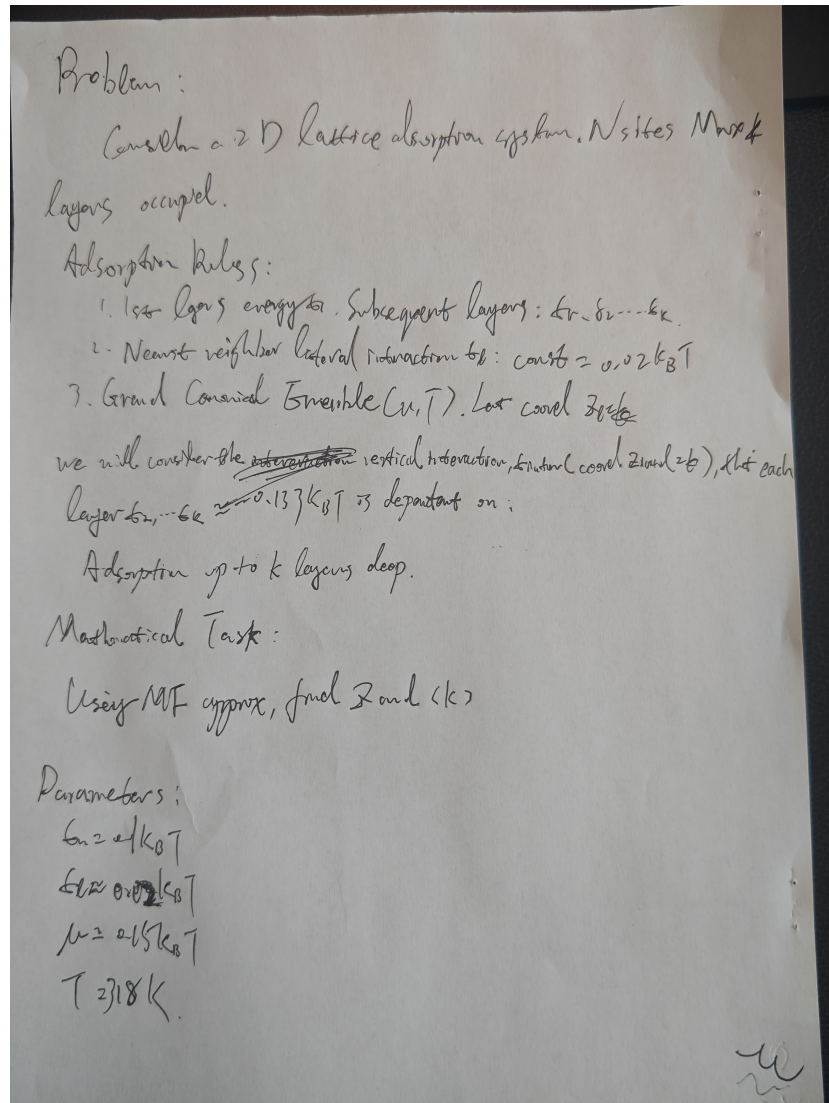


Figure 3: Case II: Simulation of the Phantom Parameter Source Manuscript Reconstruction (Not real evidence). Demonstrates how OCR or data entry errors acting on correct expert notes generate the incoherent text found in HLE.

If these deductions are correct, it implies **this is not only a good question, but a hardcore and elegant physics problem.** The depth of understanding of

the physical model is not superficial; it introduces concepts from the SOS model combined with the Ising model mean-field approximation. It requires the solver to profoundly understand both "vertical layer stacking" and "lateral neighbor interactions," demanding strong Hamiltonian construction skills. Furthermore, the setting of  $k = 4$  is ingenious—usually,  $k \rightarrow \infty$  converges, but  $k = 4$  simulates a "confined adsorption space" (like adsorption in a nanopore), clearly constructed based on a physical scenario. Re-evaluating the repaired question, it comprehensively tests the summation of grand canonical partition function series, the handling of mean-field self-consistency equations, and the statistical definition of average particle numbers. This was originally a perfect question to filter out students who only memorize formulas.

And **the author must be a senior master of physics**. He rigorously established a self-consistent parameter system where the number of layers is neither zero nor infinite, yielding a meaningful parameter of 1.66, demonstrating the master's deep intuition for the physical image—knowing exactly how to set parameters to keep the system in a half-filled state.

This is no longer an exam question; it is a **riddle**. HLE claims to be the "Human Level Limit," but the true limit of this question is that you must be able to:

- Use telepathy to guess what might have been written on the primitive PDF or manuscript held by the author.
- Profoundly understand and integrate physics theories.
- Profoundly understand the technical boundaries of current mechanical data entry.
- Profoundly understand the common error patterns of a layperson facing handwritten advanced physics problems.
- **Possess the computational resources for brute-force calculation and the knowledge of informational reverse-engineering modeling, assuming the above four conditions are met.**

**For any human or model attempting to solve this via first principles of physics, failure is inevitable.** Any model that "answers correctly" proves only that its training data was contaminated with the raw sample of this broken question, or it made a speculative guess. However, for future work, this question serves as an excellent "canary"—an ultimate probe to detect which models actively used the HLE public set for goal-distorted training.

### 4.3 Case III: A Visual Counterfeit — Truth Distortion in 673738...

#### Item Metadata

- **Item ID:** 6737382a90a20eb348edbe23
- **Dataset:** HLE
- **Domain:** Mathematics (Projective Space)
- **Verification Status:** Verified; Standard Answer is Incorrect
- **Verification Method:** Monte Carlo Simulation + Direct Derivation

#### Original Question

What is the complex dimension of the space of global sections of the sheaf  $\Omega_{\mathbb{P}^n_{\mathbb{C}}}^1 \otimes \mathcal{O}_{\mathbb{P}^n_{\mathbb{C}}}(2)$  of algebraic differential one forms tensored by the squared hyperplane bundle in the complex projective space?

#### Standard Answer and Format

- **Format:** Algebraic Expression
- **Standard Answer:**  $(n + 1)^{n+1} - \frac{(n+2)(n+1)}{2}$

#### Verification and Explanation:

This is a problem regarding complex projective space [4]. The question clearly examines the rigid constraint of the Euler sequence. We can easily write a program to brute-force calculate values for  $n = 1 \sim 5$ :

Table 7: Numerical Verification for Complex Projective Space Problem

n Value	Correct Dim.	Standard Answer	Contradiction
0	0	0	Consistent
1	1	1	Consistent
2	3	21	7× Error
3	6	246	41× Error
4	10	3121	312× Error
5	15	46651	3110× Error

It is obvious that the numerical solution given by the standard answer directly contradicts the Euler sequence. Specific numerical verification shows significant

discrepancies, and the result cannot be explained by any geometric meaning. The standard answer is undoubtedly incorrect.

Through rigorous derivation, the correct answer is  $\frac{n(n+1)}{2}$ .  
However, we observe:

- In the expression  $(n+1)^{n+1} - \frac{(n+2)(n+1)}{2}$ , if the exponent of the first term is changed to **2**, upon simplification, it exactly equals  $\frac{n(n+1)}{2}!!$

Could this be a coincidence? Again, **considering the background, the author is unlikely to be mediocre**, as this question examines complex projective space, sheaves, tensor products, Euler sequences, and cohomology calculation. As a benchmark question, it has high value—it requires constructing an exact sequence based on geometric definitions.

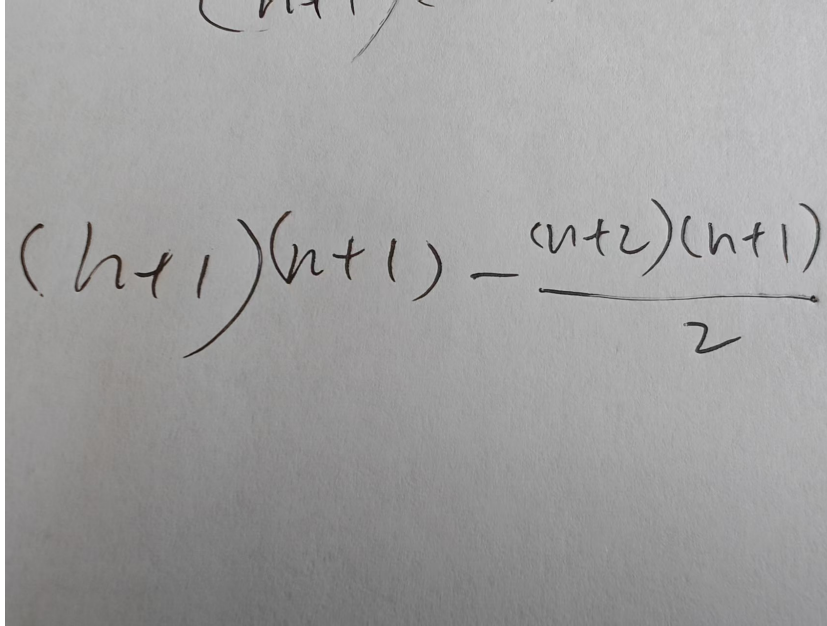
Further observing the form of the standard answer, consider:  $(n+1)^{n+1} - \frac{(n+2)(n+1)}{2}$

If visually rewritten into the most likely approximate form:  $(n+1)(n+1) - \frac{(n+2)(n+1)}{2}$

It fits the problem perfectly! It matches the numerical solution! And it perfectly explains all issues:

- **The author is likely a rigorous academic, trained in orthodox algebraic geometry, and a master in the field of complex projective space.**
- In algebraic geometry, the core of calculating cohomology dimension lies in using the correct short exact sequence. When the master wrote  $(n+1)(n+1)$ , in the eyes of a professional, the ontological status of these two "n+1"s is completely different:
  - The first  $(n+1)$  represents the Rank of the Bundle.
  - The second  $(n+1)$  represents the dimension of the polynomial space.
  - Retaining the product form  $(n+1)(n+1)$  is to demonstrate to the reader: **"I obtained this term by multiplying Rank by Dimension."** If written directly as  $(n+1)^2$  or expanded to  $n^2 + 2n + 1$ , this geometric meaning would be obliterated.
  - For experts, retaining this multiplicative structure is a self-evident annotation.
- The subtracted term  $\frac{(n+2)(n+1)}{2}$  represents  $H^0(\mathbb{P}^n, \mathcal{O}(2))$ . This is also an independent geometric object.

- Therefore, if the author provided the standard answer in the detailed form  $(n+1)(n+1) - \frac{(n+2)(n+1)}{2}$ , it is a manifestation of extreme professional integrity. They were not providing a cold number, but a logical chain from the start.



A photograph of a piece of paper with handwritten mathematical notation. The expression is  $(n+1)(n+1) - \frac{(n+2)(n+1)}{2}$ . The handwriting is in dark ink on a light-colored background. The first part,  $(n+1)(n+1)$ , is written with a large, slightly slanted 'n'. The second part,  $\frac{(n+2)(n+1)}{2}$ , is written as a fraction with the numerator  $(n+2)(n+1)$  and the denominator '2'.

Figure 4: Case III: Hypothetical Reconstruction of the Handwritten Manuscript for the "Visual Counterfeit"

But for a mechanical OCR system or a clerk ignorant of mathematics, this becomes a disaster. It is highly probable that because the handwriting was slightly "slanted," the OCR or clerk misidentified  $(n+1)(n+1)$  as  $(n+1)^{n+1}$ ..., twisting everything.

After the forensic reckoning of these three cases, we ask: **When every accident in a city can be precisely reconstructed to the path of the wound, should we suspect bad luck caused by planetary alignment, or the presence of a serial killer in the city?**

#### 4.4 Endogenous Defects: Pathological Backtracing of "Mechanistic Lesions" Based on Result Features

Our analysis data are not cold numbers; they are "fingerprints" left on the datasets by two different production mechanisms. By extracting features from Q1 (Trap Zone) and Q3 (Chaos Zone) and placing the programmatic verification rates of

GPQA and HLE (90.1% vs 66.7%) under a microscope, we can reconstruct the precise path of the "fatal wounds" of these two benchmarks [15, 16, 14].

### **GPQA's Sample: A Precise "Bear Trap" and Era Mismatch**

In the quadrant analysis of GPQA, we observed a characteristic phenomenon: extremely high mathematical logic completeness (90.1% verifiable) coexists with an extreme enrichment in the Q1 quadrant (58 questions). This presents the characteristics of a **high-IQ crime**—the questions are bad, but they are bad in a rigorous way.

#### **• Evidence A: The "Perfect Hallucination" of Q1**

- **Fact:** In the Q1 zone (High Consensus, Low Accuracy), models do not make random mistakes; they jump into the same pit in unison.
- **Mechanism Backtracing:** This is the *"Perverse Incentive Trap"* set by GPQA in 2023 to pursue difficulty [6]. Its production process explicitly rewarded questions that *"successfully mislead non-experts"* and introduced *"post-hoc consistency"* as a fallback—forcing experts who got it wrong to find reasons to convince themselves *"the question is valid"* after seeing the answer. This process does not filter for truth but for *"the most deceptive misleading logic."*
- **Evolution and Outcome:** This forced high-level authors to shift their focus from *"constructing scientific depth"* to *"designing intuitive traps."* Baits once used to capture GPT-3.5 have today become the culprits inducing *"mass hallucinations"* in models with stronger generalization capabilities. Q1 is not a collection of messy errors, but **advanced bear traps laid by hunters of a past era, still functioning today.**

#### **• Evidence B: The 90.1% Programmatic Verification Rate**

- **Fact:** The vast majority of GPQA questions, even if the answers are set incorrectly, remain executable and closed-loop in their underlying physical/mathematical models.
- **Mechanism Backtracing:** This proves the competence of the author group did not collapse. The designers of GPQA set strict entry standards [6].
- **Evolution and Outcome:** GPQA is *"outdated,"* not *"inferior."* It is a well-designed old machine. The 26.8% lower bound error rate is the inevitable price paid by authors introducing edge cases in pursuit of extreme *"trickiness."* It was the pinnacle of creativity in 2023, but in 2025, it has become an old map with high precision but shifted coordinates.

### **HLE's Sample: "Scientific Ruins" Dismembered by Screening Mechanisms**



HLE presents characteristics distinctly different from GPQA. If GPQA is a hunter's trap, HLE is a ruin piled with expensive materials. The disorder of the Q3 quadrant and the plummeting verification rate point directly to **a devastating deviation in the understanding of "scientific nature" by the HLE project management.**

- **Evidence C: The "Entropy Explosion" of Q3**

- **Fact:** Unlike GPQA's *"orderly pit-jumping,"* HLE shows models at a loss in the Q3 zone (Very Low Consensus, Very Low Accuracy). Different models give divergent answers, and *"null values"* are frequently returned.
- **Mechanism Backtracing:** This is the core mechanism HLE took pride in, which ultimately proved fatal—"Adversarial Filtering" [7]. This process mandated that regardless of question quality, any question frontier models (like GPT-4) could answer correctly was discarded as *"simple"*; this deprived the filter of judgment regarding *"logical completeness"* [16, 24], likely retaining *"pseudo-hard problems"* that were unsolvable due to brokenness.
- **Evolution and Outcome:** In 2025, models possess high scientific literacy; questions they can *"answer right"* are often well-defined, logically complete good questions. Yet, the HLE mechanism caused a *"Centrifuge Problem"* scientific accident. Model errors (Effect) stem from two distinct causes (Cause): either the question touches the deep waters of truth (*Good Hard*), or the question logic collapses (*Bad Broken*). This adversarial system completely lost the ability to distinguish between the two. It only asks the model *"can you do it,"* never *"can you read it."* This leads to a tragic conclusion: even if top scholars submitted *"Golden Hard Problems"* reaching the edge of human wisdom, once they unfortunately mixed with the massive volume of *"insolvable waste"* generated by typos or cognitive confusion, and the system only retained "wrong" answers, a *"Signal-to-Noise Ratio Collapse"* became a mathematical certainty. **Adversarial filtering essentially became a centrifuge spinning in the wrong direction**—instead of purifying wisdom, it tragically drowned true high-IQ problems in geometrically growing noise and ruins.

- **Evidence D: The 66.7% Verification Rate Cliff**

- **Fact:** Compared to GPQA, HLE's mathematical verifiability plummeted by nearly 24 percentage points. A large number of questions essentially failed to construct a mathematical map when attempting conversion to Python code.

- **Mechanism Backtracing:** This corresponds to the “5-minute review time limit” and “priority for unpublished experiments” principles set by HLE management [7].
- **Evolution and Outcome:** This is direct evidence of a lack of scientific literacy in management. True scientific problems (like specific solutions to Navier-Stokes equations) can never be falsified in 5 minutes. This rule opened a back door for “academic speculators”—as long as it is written obscurely enough (or fabricated) that the reviewer cannot understand it in 5 minutes, it slips into the question bank. That plummeting verification rate is the scientific baseline washed away when the mud flowed down.

### Conclusion: From “Poisoned Candy” to “Rotten Apples”

When we expose these four sets of evidence under the shadowless lamp of academia, the conclusion requires no further debate:

Table 8: Comparison of Pathological Features between GPQA and HLE

Dimension	GPQA (2023)	HLE (2025)
Lesion Morphology	Q1 Trap (Collective Hallucination)	Q3 Chaos (Collective Collapse)
Code Vitals	90.1% Verifiable (Structurally Intact)	66.7% Verifiable (Structurally Fragmented)
Pathogen Source	Excessive Artifice	Failed Control
Characterization	<b>Poisoned Candy</b> (Made to test poison resistance)	<b>Rotten Apple Pile</b> (Residue of failed sorting mechanism)

Although the Diamond subset of GPQA is no longer suitable as a yardstick for high-end AI, it **did its best**. It is a fossil left by the game between human intelligence and machine intelligence on the eve of the LLM dawn in 2023; its “errors” are the “**Creativity Tax**” explorers of that era had to pay for this purpose [1].

HLE is different. As a project of 2025, it failed its era, and more so, failed the scholars who truly contributed wisdom to it. Its failure stems not from the untouchability of scientific boundaries, but from the management team replacing scientific thinking (falsifiability and consensus) with traffic thinking (adversarial models), eventually **churning the blood and sweat of countless high-level scholars, along with industrial waste mixed in due to audit loopholes, into this swamp of data that cannot be defined, calculated, or seemingly even falsified.**

## 5 Why GPQA.Diamond and HLE Exhibit Scientific Insolvency

### 5.1 Popper's Tribunal: The Black-Boxing of Benchmarks Viewed from the "Continuum"

If we view Benchmarking as a form of scientific experiment, it must accept the core iron law proposed by Karl Popper in *The Logic of Scientific Discovery* — **Falsifiability** [1]. A proposition that does not allow for independent verification and refutation is not science, but theology. In our audit, we found that a large number of questions actually reside in a gray area of "unfalsifiability." Taking question '672caa...' as a non-isolated example, this "scientific insolvency" is not a metaphor, but a stark reality.

- **Evidence E: The "Zero" That Cannot Be Falsified**

- **Question ID:** 672caa8a948e810916427a4c
- **Original Text:** By a continuum we mean a compact connected metric space. We call a continuum decomposable to mean it is the union of two proper subcontinua... What is the smallest possible cardinality of the collection of regular proper subcontinua of a nondegenerate decomposable continuum?
- **Standard Answer:** 0
- **Forensic-Level Analysis:** This question demonstrates a suffocating "*Black Box Authority*".
  1. **Lack of Axiomatic Constraints:** Continuum theory is full of pathological counterexamples. To construct a special case where the cardinality is 0 requires not only extreme geometric imagination but also heavy reliance on a specific, non-universal topological construction context.
  2. **Impossibility of Verification:** For this question, even a topology expert, without having read the specific, likely obscure paper cited by the question setter, cannot derive the conclusion "0" through universal logic.
  3. **Conclusion:** When the truth of a question depends not on an axiomatic system, but on "*whether you happened to read the obscure paper the question setter read*", it no longer tests intelligence or reasoning, but the retrieval of a private knowledge base. Logically, this constitutes a "*Dictatorship of the Setter*". When you must *precisely reproduce the neural pathways of the setter reading a paper* to score, this is no longer

an IQ test, but a test of "*Mind Reading*". This is a scientific infinite loop and a betrayal of the public nature of benchmarking.

## 5.2 The Collapse of Axioms: High-End Benchmark Metrics vs. Harsh Reality

To quantify the degree of "insolvency," we need a true "ruler." A high-end Benchmark serving high-end AI models must meet the following metrics [25, 17, 15]. However, the performance of GPQA and HLE represents a **comprehensive deviation** from these standards:

Table 9: The Essential Gap Between GPQA/HLE and Scientific Benchmarks

Core Metric	Scientific Meaning	Reality of GPQA/HLE
<b>Axiomatic Truth</b>	The answer must be a unique truth under first-order logic, independent of subjective interpretation.	<b>Decay of Truth:</b> Heavily relies on ambiguous descriptions and implicit assumptions; some directly violate mathematical constraints.
<b>High Signal-to-Noise</b>	The inherent error rate of questions should approach 0, far below the differentiation between tested models.	<b>Collapse of SNR:</b> Extremely high inherent error rates cause the "noise" to completely drown out the "signal" of model capabilities.
<b>Cognitive Complexity</b>	Tests the depth of reasoning chains.	<b>Goal Alienation:</b> Disguises "obscure long-tail knowledge" as "intelligence," testing retrieval rather than reasoning.
<b>Independent Verification</b>	Any trained third party must be able to reproduce the truth value.	<b>Black Box:</b> A mass of mathematical problems cannot be independently verified via programmatic means.

### 5.3 The Terrifying "Lower Bound": Dark Matter Beneath the Iceberg

The figures presented in this report — GPQA 26.8% and HLE 58.0% inherent error rates — are not final conclusions, but an extremely optimistic **mathematical lower bound** [14]. **Note our methodology: We only audited Math questions that are logically hardest, least ambiguous, and easiest to verify programmatically ( $\Omega$  &  $\Psi$  types).**

- Mathematical language is the least ambiguous human language. If even these "hardest" math questions are largely wrong or unsolvable, the actual error rates for **"Language-Dependent"** questions (involving complex natural language descriptions or bio/chem experimental steps) are likely staggering.
- **Dark Matter Beneath the Iceberg:** The verified errors are just the visible tip. Beneath the surface, errors caused by vague descriptions, broken logic, and outdated knowledge constitute a massive, unmeasurable "dark matter." The true inherent error rate likely exceeds the threshold where any statistical significance holds.

### 5.4 The Reverse Selection of Intelligence and the Betrayal of Industry

This is the most painful consequence of scientific insolvency: **The alienation of Benchmarks is not just a failed exam, but a "fraud" involving hundreds of millions of dollars in computing resources** [9, 21]. Theoretical research suggests a strict exponential dynamic constraint between model performance  $R$  and strategy entropy  $H$  ( $R = b - ae^H$ ) [5]. However, when the Benchmark providing the  $R$  value loses its signal-to-noise ratio, this physical law is masked.

- **"Gaslighting" Foundation Model Labs:** Top global teams (Google, DeepSeek, etc.) invest billions in compute to climb "humanity's final peak." When their models — as we measured — accurately point out missing parameters or logical contradictions, the Benchmark coldly assigns a "0 score." This forces researchers into self-doubt: Is the model not smart enough? Or not robust enough? This erroneous feedback acts like "Gaslighting," forcing models on the right path to self-castrate. **We are witnessing billions of dollars and precious GPU hours being burned day and night to correct navigation based on a wrong map.** This is misleading on an industrial scale.
- **Poison for RLHF:** More dangerously, if these contaminated datasets are used for RLHF or Post-training, we are essentially training models to "call

a stag a horse.” We are forcing high-end AI, which already possesses logical deduction capabilities, to abandon truth to cater to questions full of fallacies and traps. **This is a lobotomy of high-end intelligence, a crime against compute resources, and a massive offense to computer science.**

- **Long-tail Knowledge  $\neq$  Wisdom:** HLE’s practice of artificially inflating difficulty by piling up obscure concepts (like obscure continuum definitions) steers AI development from ”Thinkers” to ”Nerds.” **This tests reading breadth, not intellectual depth. This direction is cheap and wrong.**

## 5.5 Academic Dignity Shattered by Mechanism

We must clarify: The catastrophic performance in HLE does not imply the contributing scholars lack competence. On the contrary, **we saw profound academic skill in many original questions** [1, 15]. The root cause lies in the extremely industrialized, utilitarian production mechanism of HLE and GPQA.

- **The Evil of Adversarial Filtering:** Any question the model gets right is discarded; any it gets wrong is kept. This mechanism is like a **Centrifuge** spinning in the wrong direction — it fails to ensure ”Good Hard” (defined, logical puzzles) are kept, but probabilistically retains ”Bad Broken” (unsolvable rot) as essence. HLE retains not the crystallization of human wisdom, but the aggregate of human error. Useable, logical questions are trashed because models solve them; broken questions are enshrined because models cannot.
- **The Absurdity of 5-Minute Reviews:** Asking experts to verify a world-class hard problem in 5 minutes is a blasphemy against science.

**We officially appeal to the academic community:**

1. **Self-Audit for Dignity:** We call on frontier scholars, especially physicists and mathematicians who contributed to GPQA/HLE, to review your submissions. Check if your ingenious constructs were twisted into logical semi-finished products by the ”Adversarial Filtering” pipeline. **Your academic reputation should not verify low-quality datasets.**
2. **Circuit Breaker for Rankings:** Before thorough ”decontamination,” global model rankings should reduce or remove weights for GPQA.Diamond and HLE. **This is a requirement of science and respect for the GPUs burning day and night and the researchers working around the clock.** We must hit pause. Using these for ranking wastes compute; using them for training poisons the future.

## 6 Limitations and Generational Reconstruction

### 6.1 Limitations: The Boundaries of a Forensic Perspective

Although this study has revealed the systemic flaws of GPQA and HLE, from a rigorous scientific perspective, our work is still limited by the following boundaries:

#### 6.1.1 The Confidence Boundary of "Biopsy-Style" Sampling

We adopted a random sampling design of 100 questions for HLE. Although the statistical confidence level exceeds 95%, and the detected errors are predominantly systematic mechanism collapses rather than random deviations, in a strict mathematical sense, we cannot rule out the possibility of survivorship bias in the remaining unchecked questions. However, **when 58% of the main load-bearing pillars of a bridge are found to be fractured, continuing to inspect the integrity of every single rivet no longer yields marginal utility in a scientific sense.** We acknowledge the existence of sampling bias, but it is insufficient to challenge the macroscopic qualitative conclusion of "Benchmark Insolvency".

#### 6.1.2 The Unobservable "Dark Matter": Agnosticism Towards Other Question Types

The methodological core of this study is "Verifiability". We exclusively audited  $\Omega$ -type questions and the majority of  $\Psi$ -type questions that possess the clearest logic and **minimal ambiguity**. We maintained silence on a large number of "natural language-dependent" questions that rely on **long-tail knowledge** retrieval, biological experimental descriptions, and semantic understanding.

This is an extremely conservative limitation: if even the mathematical language, which should be the least error-prone and most objective, is riddled with fallacies, we have reason to infer that the actual error rate of "natural language-dependent" questions—which inherently carry semantic ambiguity—is likely to far exceed the current observed value. The true **gravity** of this "dark matter" remains, for now, a disturbing black box.

#### 6.1.3 The Failure of Discriminative Power: The Signal-to-Noise Collapse of the Measuring Stick

This study originally planned to compare the capability differences among top models, especially between the DeepSeek-Overclock series and Gemini 3. However, since the inherent error rate (Noise) of the Benchmark itself is far greater

than the subtle capability differences (Signal) among contemporary flagship models, our measurement results are fundamentally "invalid".

All models scored similarly on non-verifiable questions, not because they possess identical capabilities, but because **probability acts as the great equalizer when facing random noise**. We must acknowledge that this study failed to provide a conclusion on "which is the current best model", because under the current metrics, this question lacks mathematical legitimacy.

## 6.2 Outlook: From the "Age of Alchemy" to "Modern Science"

Although this study has revealed the systemic flaws of GPQA and HLE, our goal is not criticism but constructive reconstruction.

**What we need is not a patch, but a generational reconstruction.**

### 6.2.1 From "Alchemy" to "Science": Establishing a Gold-Standard Production Pipeline

Future benchmarks should no longer be **obbled together by a handful of doctoral students in their spare time through inefficient brute-force PDF retrieval**. We need to establish an industrial-grade knowledge production pipeline for the era of intelligence:

- **Closed-loop Verification:** Every question entered into the database must be accompanied by executable verification code or formal proof, strictly abolishing "pure text standard answers".
- **Inverse Adversarial Production:** We should not only retain "questions models get wrong", but also "questions models get right—provided their reasoning chain is verified". We must construct logical fortifications that are verifiable by human experts but resist stochastic forgery by models.

### 6.2.2 A "Manhattan Project" for Benchmarking

Building a high-credibility, verifiable benchmark whose complexity exceeds the capacity of any single lab or company requires the deep integration of massive compute, top-tier human intelligence, and rigorous engineering management.

We call on forward-thinking academic institutions and industrial capital to cease the futile attrition on low-quality datasets and instead redirect resources to launch the "Next Generation Standard Engineering".

We need a dedicated team of top minds—mathematicians, logicians, and engineering experts—to craft questions with the seriousness of compiling an Encyclopedia, rather than the randomness of training a spam filter.



This is not merely an investment of resources, but a restoration of scientific dignity. We need to establish a measurement system rooted in first principles of physics, treating intelligence as a measurable order parameter rather than mere statistical outcomes. **If existing mechanisms cannot produce examination papers worthy of the apex of silicon-based intelligence, we are ready with a comprehensive technical roadmap and methodology to recalibrate the true "limits of human intelligence" [5].**

This study has merely sounded the whistle. On the ruins of this bursting bubble, true scientific measurement is just beginning.

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