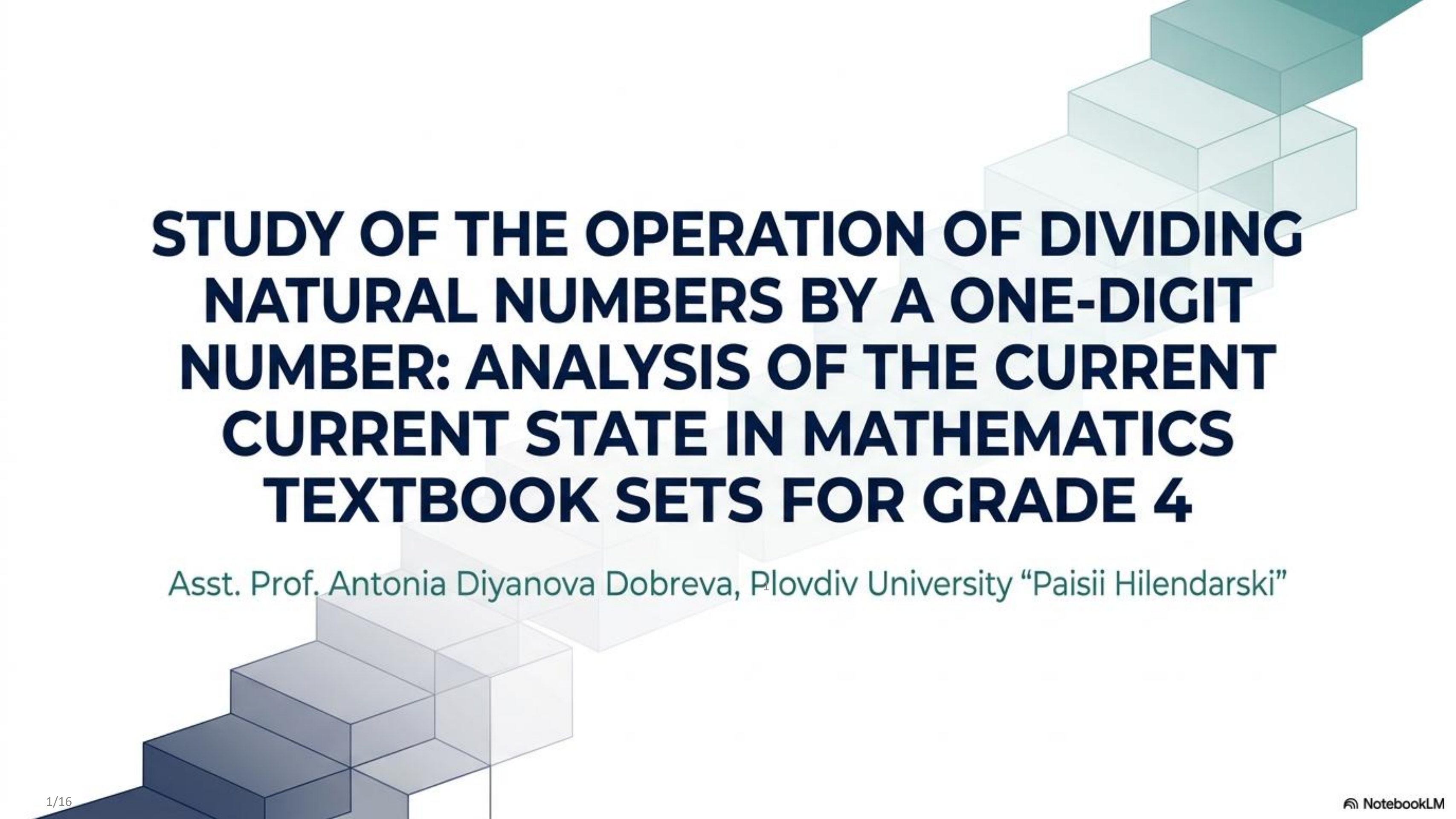


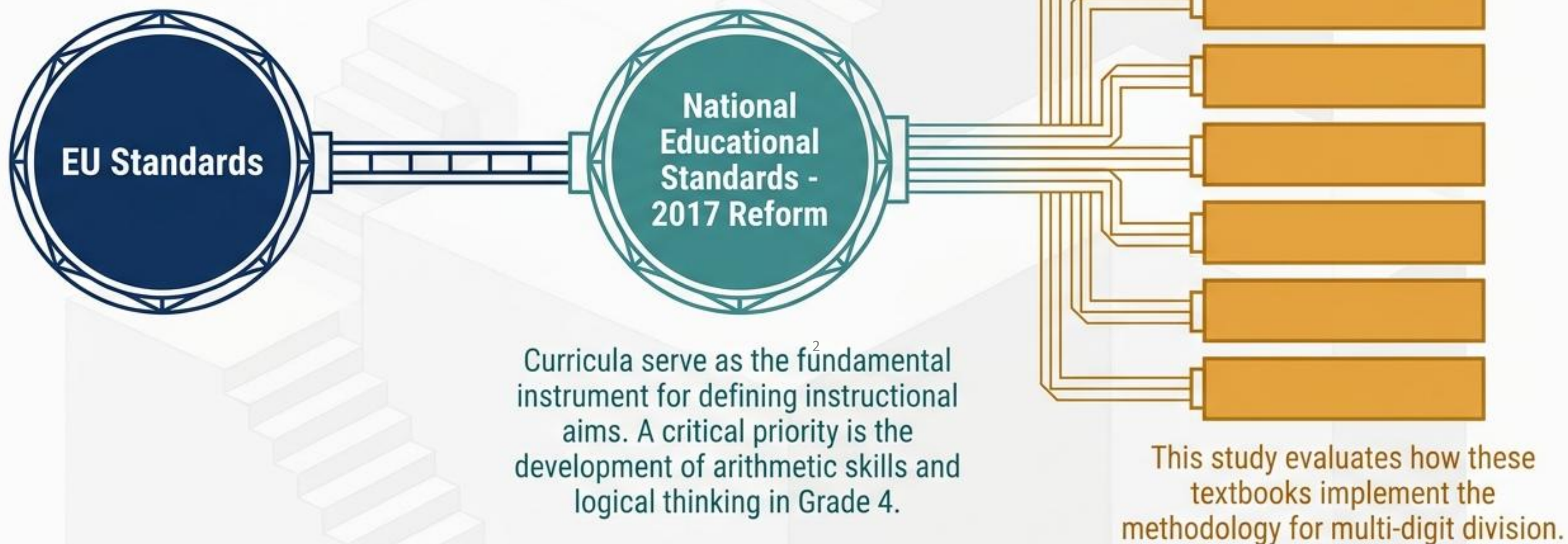


STUDY OF THE OPERATION OF DIVIDING NATURAL NUMBERS BY A ONE-DIGIT NUMBER: ANALYSIS OF THE CURRENT CURRENT STATE IN MATHEMATICS TEXTBOOK SETS FOR GRADE 4

Asst. Prof. Antonia Diyanova Dobрева, Plovdiv University "Paisii Hilendarski"

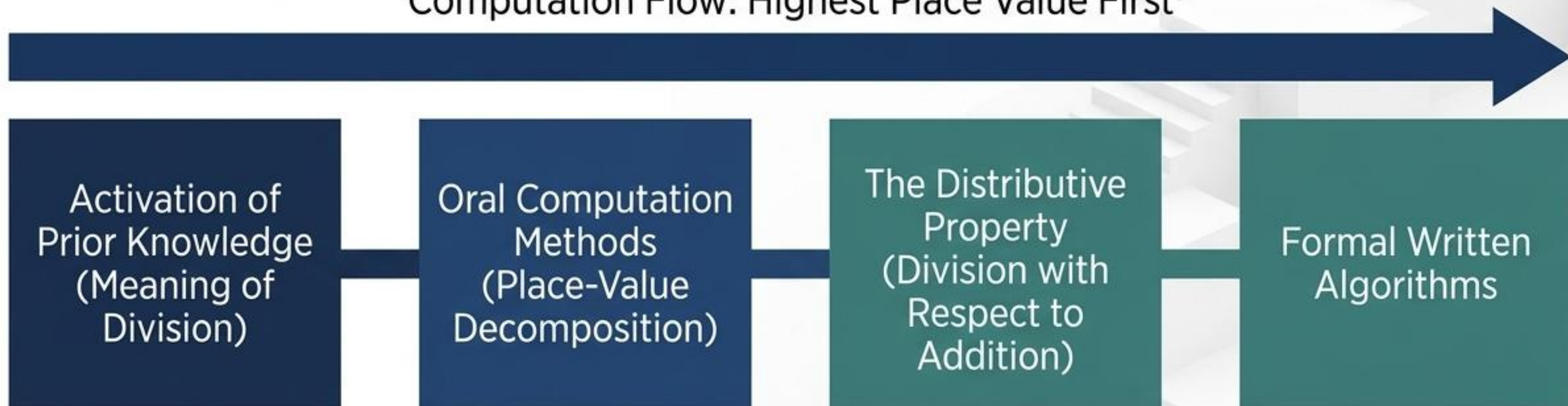
The 2017 Educational Reform & Curricular Standards

The 2017 primary mathematics reform in Bulgaria aimed to align national standards with EU expectations, ensuring high-quality, internationally competitive education.



The Logic of Computation

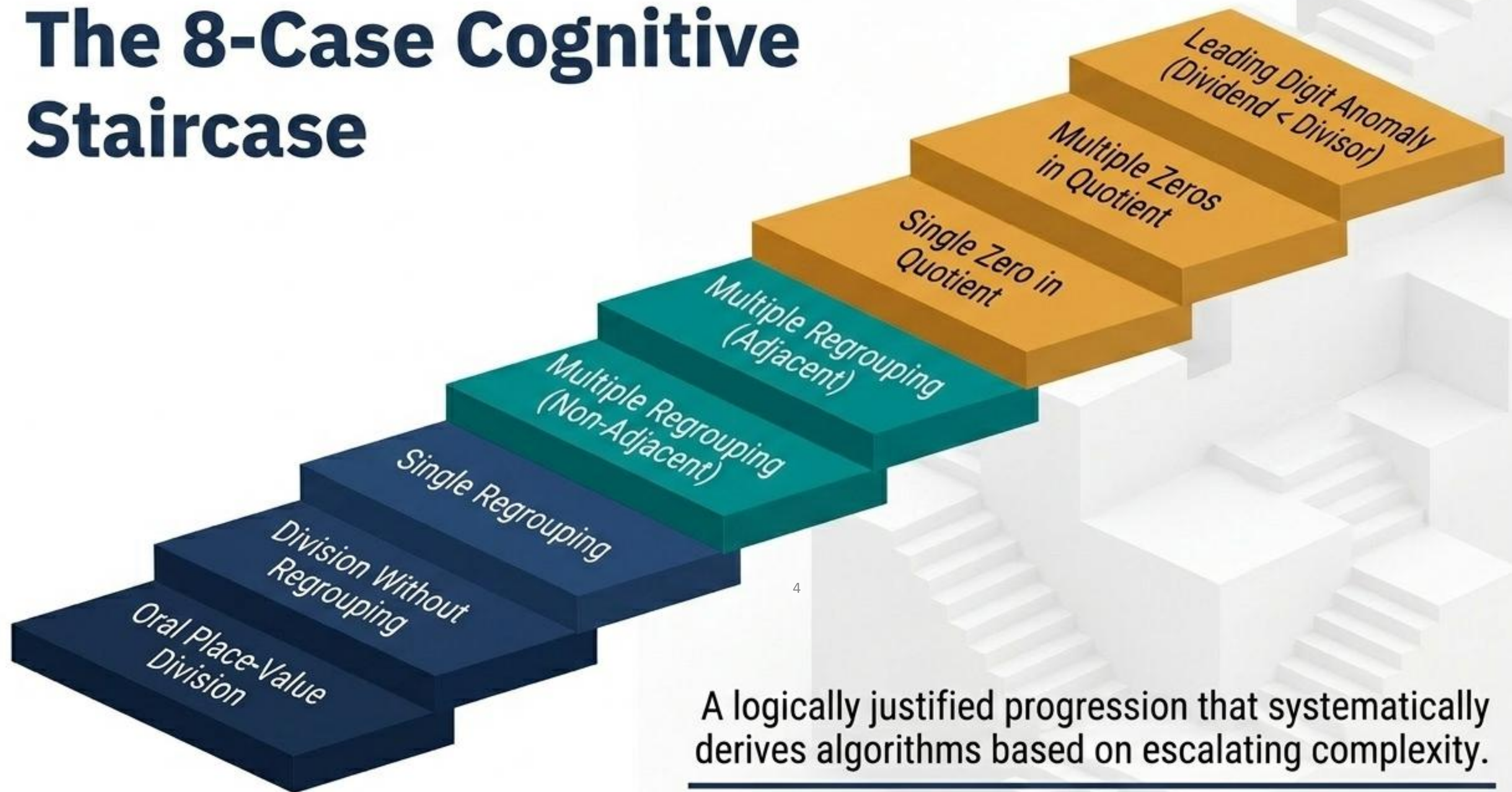
Computation Flow: Highest Place Value First



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Unlike other operations, both oral and written division algorithms must strictly commence from the highest place value of the dividend.

The 8-Case Cognitive Staircase



A logically justified progression that systematically derives algorithms based on escalating complexity.

Establishing the Base: Oral Decomposition to Written Structure

Panel A: The Oral Method



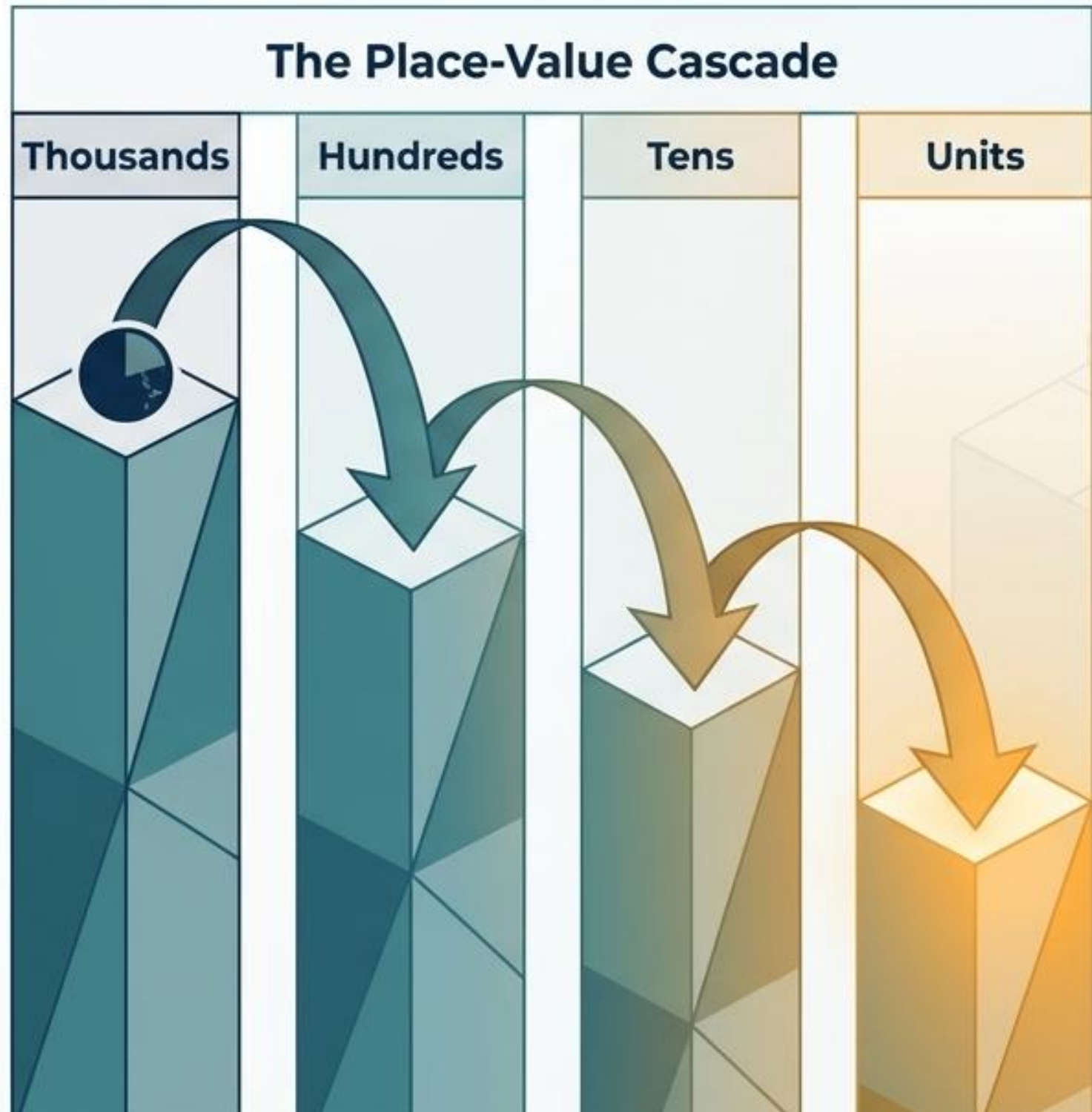
Case 1 (Oral): Relies on representing numbers as place-value units and applying basic multiplication facts.

Panel B: The Written Algorithm

Thousands	Hundreds	Tens	Units

Case 2 (Without Regrouping): Requires a visual place-value table. The dividend is analyzed by its decimal structure, dividing each place value exactly, sequentially moving from Thousands down to Units.

Escalating Complexity: The Regrouping Cascade



Case 3: One Regrouping.

A remainder in one place value is carried to the next. Requires understanding the role of the remainder within the decimal structure.

Case 4: Non-Adjacent Regrouping.

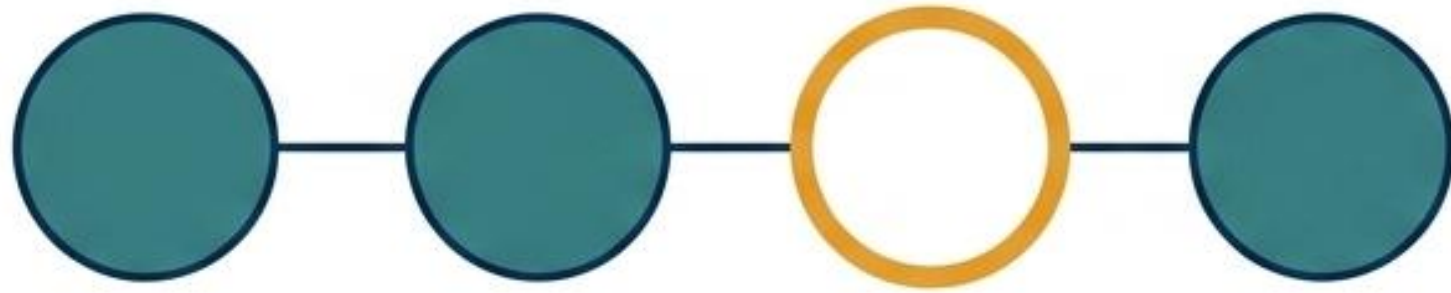
Multiple remainders appear in separated place values. Requires tracking a longer, interrupted sequence of regroupings.

Case 5: Adjacent Regrouping.

Highest cognitive demand. Remainders arise consecutively. Pupils must manage successive, uninterrupted regroupings without losing algorithm logic.

Exceptional Scenarios: Zeros and Leading Anomalies

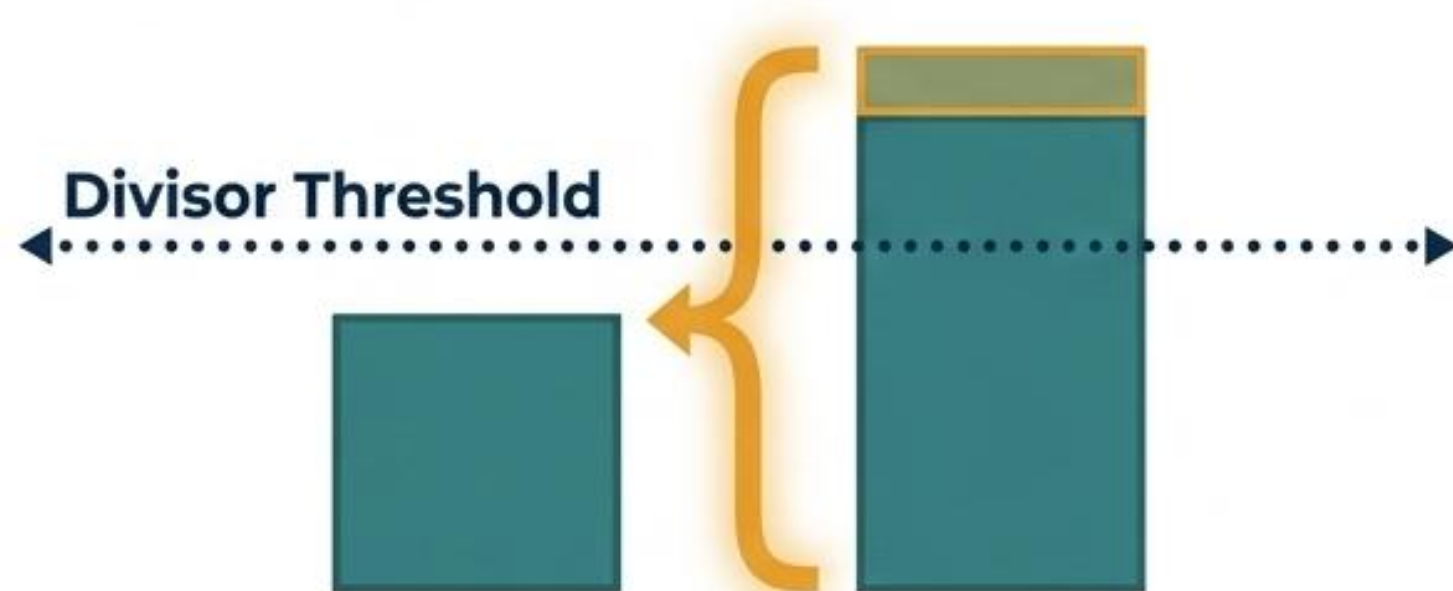
Graphic 1: The Null Space



Cases 6 & 7: The Null Space.

Involves quotients containing one or multiple zeros. Methodologically critical because pupils often omit zero, failing to recognize it as a significant positional digit.

Graphic 2: The First-Digit Merge



Case 8: The Leading Digit Anomaly.

The leading digit of the dividend has fewer units than the divisor. A conceptual challenge requiring the pupil to combine the first two digits, fundamentally altering the placement of the first quotient digit.

Analyzing the Current State: The 7 Approved Textbooks

How effectively do the current curricula translate the 8-case cognitive framework into classroom practice?

Arhimed

Riva

Prosveta
Plus

Bulvest
2000

Anubis

Prosveta

Bit i
Tekhnika

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All textbooks formally comply with the 2017 curricular standard, yet substantial differences exist in logical progression and methodological scaffolding.

Comparative Matrix: Foundational Methodological Support

	Prosveta Plus	Bulvest 2000	Arhimed	Riva	Anubis	Prosveta	Bit i Tekhnika
Clear Oral Method Introduction (Decomposition)	●	●	●	◐	◐	○	◐
Use of Visual Place-Value Tables	●	●	●	○	○	○	◐
Explicit Step-by-Step Written Algorithms	●	●	●	◐	◐	○	◐

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Key Takeaway: While textbooks like Prosveta Plus offer clearly formulated algorithms and tabular visual support, others (e.g., Riva, Prosveta) rely merely on transferring prior Grade 3 knowledge or presenting solved examples without explicit procedural rules.

Comparative Matrix: Advanced Scaffolding & Exceptions

	Prosveta Plus	Arhimed	Bulvest 2000	Riva	Anubis	Prosveta	Bit i Tekhnika
Explicit Focus on Successive Regrouping	●	●	◐	○	○	○	○
Targeted Guidance for Zero(s) in Quotient	●	◐	●	○	○	○	○
Structural Support for Leading Digit Anomaly	●	●	◐	○	○	○	○

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Key Takeaway: A significant methodological drop-off occurs in exceptional cases. Several publishers do not distinguish these as new cognitive challenges, instead embedding them into general exercises, increasing the likelihood of mechanical application and error.

Synthesis: The Methodological Gap



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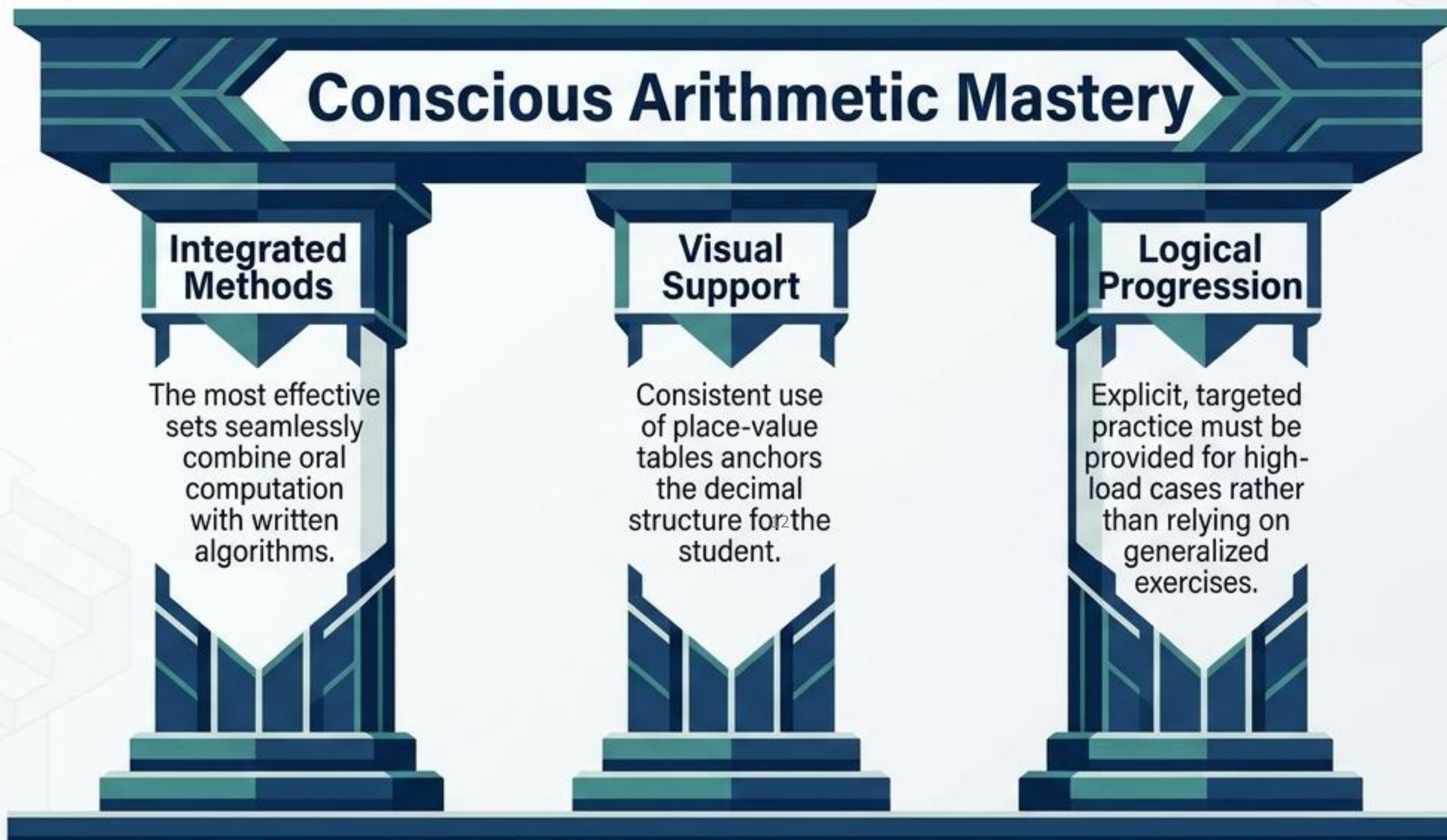
The study reveals a critical pedagogical reality. While all 7 textbook sets fulfill the formal requirements of the curriculum, they provide vastly different levels of cognitive scaffolding.

Unjustified jumps in difficulty are common. Complex cases are frequently left for independent work without explicit commentary.

Conclusion: The textbook alone is insufficient to guarantee conscious mastery.

Conclusions: Criteria for Efficacy

The proposed 8-case system fully encompasses the primary curriculum and serves as an ideal evaluative criterion for textbook completeness.



Recommendations for Practice & Development



Sequence

Strictly observe the 8-case logical sequence. Never skip foundational steps to accelerate to complex regrouping.



Integration

Systematically combine methods. Oral computation must serve as the cognitive basis for understanding the written algorithm.



Emphasis

Target complex cases specifically. Isolate leading-digit anomalies and zero-quotient tasks with distinct methodological commentary.



Context

Utilize real-life word problems to introduce algorithms, aligning with the competence-based approach in modern education.

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The Crucial Role of the Teacher



Textbooks are tools, not the totality of the curriculum. Where textbook sets exhibit methodological deficiencies or sudden jumps in cognitive load, the teacher must intervene.

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1. Critically analyze the chosen textbook against the 8-case framework.



2. Actively compensate for missing elements through additional visual models.



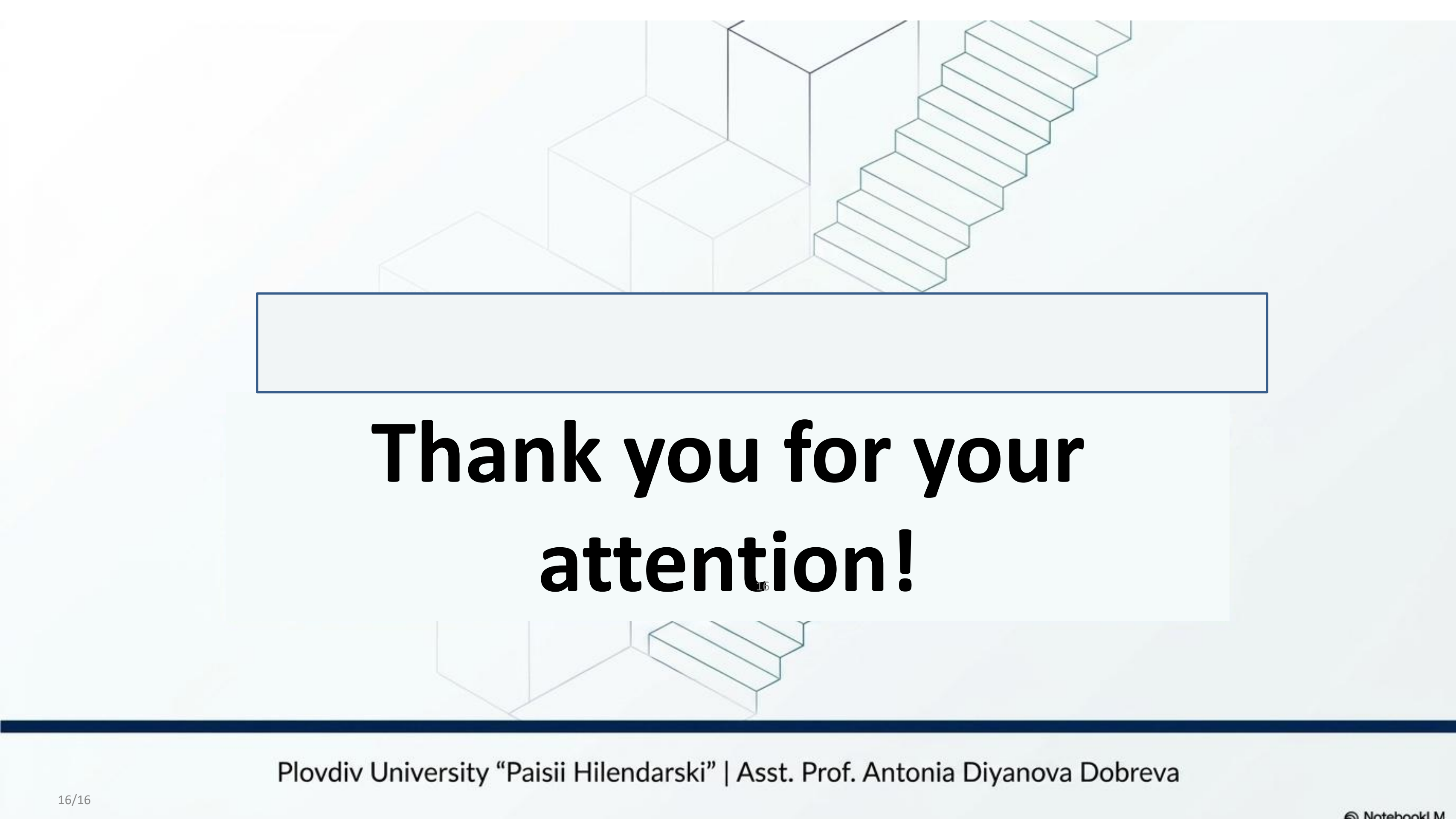
3. Provide intentional oral explanations for complex regrouping to ensure systematic, conscious mastery in Grade 4.



Acknowledgements

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**Thank you for your
attention!**