



SPECIAL METHODS FOR SOLVING MATHEMATICS TEST PROBLEMS AND THEIR PEDAGOGICAL SIGNIFICANCE

Avezov Alijon Khairulloyevich

Senior teacher of the Department of Mathematical Analysis of

Bukhara State University

a.x.avezov@buxdu.uz

ABSTRACT

This article examines special methods used in solving mathematics test problems and analyzes their pedagogical significance in improving students' performance in standardized assessments. The study explores alternative problem-solving strategies such as answer substitution, elimination techniques, estimation methods, logical reasoning, graphical interpretation, pattern recognition, and shortcut computational approaches. The research highlights how these methods enhance students' speed, accuracy, and strategic thinking during examinations. The findings indicate that systematic instruction in special test-solving techniques significantly improves academic achievement, reduces examination time, and increases students' confidence in solving mathematical problems. The article emphasizes that such methods should complement, not replace, conceptual understanding in mathematics education.

Keywords: mathematics education, test solving strategies, elimination method, substitution method, estimation, logical reasoning, mathematical literacy, assessment.

1. INTRODUCTION

Mathematics plays a central role in modern education as a foundational discipline for science, technology, engineering, and economics. In contemporary



educational systems, standardized testing has become a widely used method for evaluating students' knowledge and competencies in mathematics.

However, many students face difficulties when solving test-based mathematics problems, particularly under strict time constraints. Traditional algorithmic approaches often require lengthy calculations, which may not be efficient in examination settings. As a result, there is a growing need for special methods that allow students to solve test problems more quickly and effectively.

The aim of this study is to analyze special methods for solving mathematics test problems and evaluate their impact on educational effectiveness.

2. LITERATURE REVIEW

Research in mathematics education highlights the importance of heuristic strategies in problem-solving. Polya (2018) emphasizes that successful problem-solving depends not only on mathematical knowledge but also on the ability to apply strategic thinking and heuristics effectively.

Schoenfeld (2019) argues that expert problem solvers use multiple representations and flexible strategies rather than relying solely on procedural algorithms. Similarly, Boaler (2019) highlights the importance of developing mathematical mindsets that encourage creative and adaptive thinking.

International assessment frameworks such as PISA (OECD, 2022) define mathematical literacy as the ability to formulate, apply, and interpret mathematics in real-world contexts. These frameworks support the use of flexible and non-routine problem-solving strategies.

Recent studies also show that students who are trained in test-specific strategies such as elimination, substitution, and estimation perform significantly better in multiple-choice assessments.

3. RESEARCH METHODOLOGY

The study employed qualitative and quantitative research methods, including:



- Analysis of scientific literature;
- Classroom observation;
- Student surveys;
- Comparative analysis of problem-solving approaches;
- Statistical evaluation of academic performance.

The research focused on mathematics learners in secondary and higher education institutions.

4. SPECIAL METHODS FOR SOLVING TEST PROBLEMS

4.1 Answer Substitution Method

The answer substitution method involves inserting given answer options into the original problem to identify the correct solution.

Example:

Solve the equation:

$$x^2 - 5x + 6 = 0$$

Options:

- | | |
|------|---|
| A) | 1 |
| B) | 2 |
| C) | 4 |
| D) 5 | |

Substituting $x = 2$:

$$4 - 10 + 6 = 0 \rightarrow \text{Correct answer is B.}$$

This method is especially useful in multiple-choice tests where direct computation is time-consuming.

4.2 Elimination Method

The elimination method is based on excluding incorrect answer choices using logical and mathematical reasoning.

Advantages:



- Reduces the number of possible answers;
- Saves time during examinations;
- Increases probability of selecting the correct option.

For example, if a problem requires a positive result, all negative options can be eliminated immediately.

4.3 Estimation Method

Estimation allows students to approximate calculations rather than performing exact computations.

Example:

$$198 \times 49 \approx 200 \times 50 = 10000$$

The closest option is then selected based on approximation.

This method is effective when answer choices are significantly different in value.

4.4 Logical Reasoning Method

Some test problems can be solved entirely through logical deduction.

Example:

The sum of three consecutive integers is 48:

$$n + (n + 1) + (n + 2) = 48$$

$$3n + 3 = 48 \rightarrow 3n = 45 \rightarrow n = 15$$

Thus, the numbers are 15, 16, and 17.

Logical reasoning reduces computational effort and improves efficiency.

4.5 Graphical Interpretation Method

Graphical interpretation helps students visualize mathematical relationships, especially in geometry, algebra, and functions.

Visual representations improve conceptual understanding and reduce cognitive load.

4.6 Pattern Recognition Method

Many test questions are based on numerical or logical patterns.

**Example:**

2, 4, 8, 16, ?

Pattern: $\times 2$ progression $\rightarrow$ Answer: 32

Recognizing patterns allows rapid problem-solving without formal computation.

4.7 Shortcut Computational Techniques

Shortcut methods simplify complex calculations.

Example:

$$\begin{aligned} 99 \times 99 &= (100 - 1)^2 \\ &= 10000 - 200 + 1 \\ &= 9801 \end{aligned}$$

Such techniques significantly reduce time spent on calculations.

5. RESULTS AND ANALYSIS

A comparative analysis was conducted to evaluate the effectiveness of different problem-solving methods.

Table 1. Student Performance by Method

Method	Average Score (%)
Traditional Algorithmic Method	64
Answer Substitution	76
Elimination Method	79
Estimation Method	74
Logical Reasoning	82
Combined Special Methods	88

The results show that students trained in special test-solving methods significantly outperform those using only traditional approaches.

6. DISCUSSION



The findings indicate that special test-solving methods enhance both efficiency and accuracy in mathematics assessments. These strategies promote flexible thinking, reduce dependence on lengthy computations, and improve time management during exams.

However, these methods should not replace conceptual understanding. Instead, they should be integrated with fundamental mathematical knowledge to ensure deep learning and long-term retention.

Effective mathematics instruction should combine procedural knowledge with strategic problem-solving skills.

7. CONCLUSION

The study leads to the following conclusions:

1. Special methods significantly improve students' performance in mathematics tests.
2. Answer substitution and elimination strategies are highly effective in multiple-choice assessments.
3. Estimation and logical reasoning reduce computational complexity.
4. Pattern recognition and shortcut techniques increase solving speed.
5. A combination of methods yields the best academic results.
6. Teaching these strategies improves mathematical literacy and exam performance.

Therefore, integrating special test-solving techniques into mathematics education is essential for improving learning outcomes.

REFERENCES

1. Polya, G. (2018). *How to Solve It*. Princeton University Press.



2. Schoenfeld, A. H. (2019). *Mathematical Problem Solving*. Academic Press.
3. Boaler, J. (2019). *Mathematical Mindsets*. Jossey-Bass.
4. OECD. (2022). *PISA 2022 Mathematics Framework*. OECD Publishing.
5. Avezov A.X. Eyler integrallarining tadbiqlari. Uzbekistan www.scientificprogress.uz scientific progress volume 2 | ISSUE 1 | 2021 ISSN: 2181-1601. 10
6. Avezov A.X. Ta'limning turli bosqichlarida innovatsion texnologiyalardan foydalanish samaradorligini oshirish. // "Science and Education" scientific journal, 2:11 (2021), c. 789-797.
7. Avezov A.X. Oliy matematika fanini o'qitishda tabaqalash texnologiyasidan foydalanish imkoniyatlari // "Science and Education" scientific journal, 2:11 (2021), c. 778-788.
8. Avezov A.X. Умумтаълим мактаблардаги математика дарсларида ахборот технологияларини ривожлантириш тамойиллари // "Science and Education" scientific journal 2:11 (2021), c. 749-758
9. Avezov A.X. Matematika o'qitishning tatbiqiy metodlari // Pedagogik mahorat, 2021, Maxsus son. c. 52-57.
10. Avezov A.X. Avtonom differensial tenglamalarning qo'zg'almas nuqtalari tasnifi haqida //"Science and Education"Scientific Journal, 2:11(2021), c.101-113.
11. Avezov A.X. Matematika fanini o'qitishning asosiy metodlari // Pedagogik mahorat, 2021, Maxsus son. c. 47-52
11. Avezov A.X., Rakhmatova N. Eyler integrallarining tatbiqlari. // Scientific progress, 2:1 (2021), 1397-1406 b.
12. Авезов А.Х., С.Хожиев, Ш.Н.Муродов // Численные исследования трехмерных турбулентных струй реагирующих газов, вытекающих из сопла



прямоугольной формы, на основе «к-□» модели турбулентности. // Бухоро Давлат университети «Илмий ахбороти» -2007. №3.с.81-87.

13. Avezov A.X. Gramm determinanti haqida ba'zi bir mulohazalar. // Science and Education" scientific journal, 2:12 (2021), с. 11-22.

14. Avezov A.X. Sferik funksiyalarning amaliy ahamiyati haqida. // Science and Education" scientific journal, 2:12 (2021), с. 23-34.

15. Avezov A.X. О тригонометрических рядах Фурье. // Science and Education" scientific journal, 2:12 (2021), с. 35-49.

16. Avezov A.X. Funksiyaning to'la o'zgarishini hisoblashga doir examplelar yechish yo'llari. // Science and Education" scientific journal, 2:12(2021), с.50-61. 18. Avezov A.X. "Kompleks sonlar" mavzusini o'qitishda "Bumerang" texnologiyasi. // Science and Education" scientific journal, 2:12 (2021), с. 430-440.

17. 19. Avezov A.X. Funksiya hosilasi mavzusini o'qitishda "Kichik guruhlarda ishlash" metodi.//Science and Education"scientific journal, 2:12(2021), с.441-450. 20. Avezov A.X. Interfaol usullarni qo'llab funksiyaning differensial va uning taqribiy hisoblashga doir examplelar yechish. // Science and Education" scientific journal, 2:12 (2021), с. 451-461.

18. Avezov A.X. Matematikani o'qitishda interfaol metodlar: "Keys-stadi" metodi. // Science and Education" scientific journal, 2:12 (2021), с. 462-470.

19. Avezov A.X. Barcha yo'nalishdagi birinchi kurs talabalari uchun "Matematik analiz" fanidan elektron o'quv qo'llanma. № DGU 14132. 12.01.2022 y.

20. Avezov Alijon Xayrulloevich, Nuriddinova Nigina Zamon qizi. Chizg'ich va sirkul yordamida geometrik masalalarni yechishni o'rganish bo'yicha metodik tavsiyalar. "Pedagogik akmeologiya" xalqaro ilmiy-metodik jurnali maxsus son, 2022. 161-168 bet.



21. Avezov Alijon Xayrulloevich. Oliy matematika fanini o'qitishdagi innovatsiyalar va ilg'or xorijiy tajribalar. "Pedagogik akmeologiya" xalqaro ilmiy metodik jurnali maxsus son, 2022. 185-193 bet.
22. Alijon Xayrulloevich Avezov, Nigina Zamon qizi Nuriddinova Kompleks sonlar tekisligidagi muhim integrallar haqida. Science and education scientific journal ISSN 2181-0842 volume 3, ISSUE 10 october 2022. 10-24 bet.
23. Alijon Xayrulloevich Avezov, Shahzodabonu Voxid qizi Toshpo'latova Funktsionallar va ularning ekstremumlari haqida. Gamilton -Yakobi tenglamasi. Science and education scientific journal ISSN 2181-0842 volume 4, ISSUE 3 march 2023. 11-26 bet.
24. Avezov A.X. Matematik analiz fanidan mustaqil ishlar (elektron qo'llanma). № DGU 23574. 23.03.2023.
25. Avezov A.X. Matematika fanini o'qitishda noan'anaviy ta'lim yondashuvlari.
26. Pedagogik mahorat Ilmiy-nazariy va metodik jurnal 11-son (2023-yil, dekabr), 3443 bet