SUPERMAT Jurnal Pendidikan Matematika
Volume 10, No. 1, April 2026, hal. 44-61

E-ISSN 2599-1329
P-ISSN 2685-3124

MATHEMATICAL PROBLEM-SOLVING SKILLS OF ELEVENTH-GRADE HIGH SCHOOL STUDENTS ON CIRCLE MATERIAL

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ABSTRAK

Kemampuan pemecahan masalah matematis merupakan salah satu kemampuan penting yang harus dimiliki siswa karena dapat melatih berpikir kritis, kreatif, dan mandiri dalam menghadapi berbagai permasalahan. Namun kenyataannya, kemampuan tersebut masih belum optimal, khususnya dalam menyelesaikan soal berbasis masalah. Penelitian ini bertujuan untuk menganalisis kemampuan siswa kelas sebelas dalam menyelesaikan masalah matematika yang berkaitan dengan topik lingkaran, berdasarkan tahapan penyelesaian masalah Polya. Penelitian ini menggunakan pendekatan kuantitatif deskriptif. Subjek penelitian terdiri atas 47 siswa kelas XI yang berasal dari dua kelas. Data dikumpulkan melalui tes kemampuan pemecahan masalah matematis dan dianalisis dengan statistik deskriptif. Hasil studi menunjukkan bahwa kemampuan siswa dalam pemecahan masalah matematis secara umum masih tergolong rendah. Sebanyak 43,8% siswa berada pada kategori rendah dan 39,6% berada pada kategori sangat rendah. Berdasarkan analisis setiap indikator, siswa relatif lebih mampu pada tahap memahami masalah, sedangkan kesulitan terbesar ditemukan pada tahap merencanakan penyelesaian dan memeriksa kembali hasil penyelesaian.

Kata kunci: pemecahan masalah, polya, lingkaran

ABSTRACT

Mathematical problem-solving skills is an important skill that students must possess because it can train critical, creative, and independent thinking in facing various problems. However, in reality, this skills is still not optimal, especially in solving problem-based problems. This study aims to analyze the skills of eleventh-grade students in solving mathematical problems related to the topic of circles, based on the stages of Polya's problem solving. This study used a descriptive quantitative approach. The research subjects consisted of 47 grade XI students from two classes. Data were collected through a mathematical problem-solving skills test and analyzed using descriptive statistics. The results of the study indicate that students' mathematical problem-solving skills are generally still relatively low. As many as 43.8% of students are in the low category and 39.6% are in the very low category. Based on the analysis of each indicator, students are relatively more capable at the stage of understanding the problem, while the greatest difficulties are found at the stage of planning the solution and reviewing the results of the solution.

Keywords: problem solving, polya, circles

INTRODUCTION

Mathematics is a discipline that employs logic as a foundation for examining structures, forms, quantities, and the interrelationships among concepts. Far from being merely a subject about numbers, mathematics constitutes a symbolic system organized within the human mind. As a symbolic language, mathematics presents quantitative and spatial relationships systematically, supports logical reasoning, and serves as a powerful tool for solving problems across various fields. Mathematics is taught at all levels of education, from primary through senior secondary school, and every student deserves the opportunity to engage with it comprehensively (Putri & Santosa, 2023). The objectives of mathematics education encompass the development of appreciation for the subject, mathematical reasoning and communication skills, confidence in one's mathematical skills, and problem-solving proficiency (OECD, 2023).

Among the primary goals of mathematics education is the enhancement of students' problem-solving competence. This competence is widely regarded as an essential skill because it not only enables students to address academic problems but also trains them to think critically, independently, and creatively when confronting real-life situations (Ilhamsyah et al., 2021). Through this process, students are encouraged to actively engage with problems, construct appropriate responses, and discover logical and effective solutions (Ramadhani et al., 2024). Problem-solving skills contribute not only to academic achievement but also equip students with the capacity to navigate everyday challenges (Pertiwi & Novtiar, 2022). Consequently, instructional approaches that incorporate problem-solving strategies hold considerable potential for improving overall learning outcomes (Aini et al., 2024).

Numerous studies have revealed the mathematical problem-solving competence of Indonesian students remains at a low level. Students frequently encounter difficulties when dealing with non-routine problems that require deeper analytical thinking. Research conducted by Safitri & Rohaendi (2022) also demonstrated that a considerable number of students have not yet acquired adequate problem-solving skills, particularly for non-routine problem types. A similar situation is evident in the international arena. According to the PISA (Programme for International Student Assessment) report, Indonesian students' capacity to solve mathematical problems has consistently remained below the average of OECD member countries. This finding suggests that the issue of low problem-solving skills is not solely a local concern but also reflects systemic challenges within mathematics education. In alignment with this, Cai & Lester (2021) emphasized that mathematical

problem-solving competence forms the very core of mathematical literacy, and students who lack familiarity with non-routine problems will encounter serious obstacles in higher-order mathematical thinking. In addition, research Hidayat et al. (2022) & Ismail et al. (2022) also revealed that students' skills are still low. Observations during the learning process also showed that when given problem-based questions, students tended to find it difficult to answer, simply remaining silent and waiting for answers from their friends or teachers. These findings collectively reinforce the urgency of investigating mathematical problem-solving competence across various school contexts, including SMA Negeri 1 Batang Anai.

Based on the results of initial observations at SMA Negeri 1 Batang Anai during educational field practice activities, it was found that students still experience difficulties in solving problems that require problem-solving skills. Some students tend to immediately perform calculations without first understanding the problem thoroughly. Most students can understand the problem by making known and asked questions in the problem, but at the stage of developing a solution strategy, many students are still not able to do so. In addition, students also rarely recheck the answers they have obtained. This also makes student learning outcomes still less than optimal, as evidenced by the daily assessment score only obtaining an average of 48.12.

In this study, mathematical problem-solving skills is defined as the skills of students to solve problems mathematical through a series of stages proposed by George Polya, namely: (1) understanding problem, (2) planning a solution, (3) implementing the solution plan, and (4) recheck the results obtained. This skills is measured through a mathematical problem-solving skills test on the circle material, then analyzed based on achievement of each steps. This study is based on the problem-solving theory proposed by George Polya which states that problem-solving is a systematic thinking process that involves four main steps, namely understand the problem, developing a solution plan, implementing plan, and recheck the solution obtained. This theory is widely used in mathematics education research because it is able to describe the student's thinking process when facing a problem (Polya, 1973). In addition, this study is also supported by the constructivist view which states that knowledge is actively constructed by students through experience and interaction with the learning environment. In the context of mathematics learning, problem-solving skills shows how students construct conceptual understanding and apply it to solve problems faced (Julia et al., 2024; Nurjamilah et al., 2025). According to Surya, as cited in (Sriwahyuni & Maryati, 2022), the primary barriers faced by students

in problem-solving lie in their grasp of mathematical concepts, their capacity to read and interpret graphs, and their skills to transform information into diagrams. When low problem-solving mathematical skills is not promptly addressed, students will encounter increasing difficulty in deeply understanding mathematical material, their academic performance will decline, and their critical thinking skills will fail to develop optimally. As a consequence, they tend to rely heavily on worked examples or teacher guidance, lack self-confidence, and face obstacles when confronting real-life situations that demand decision-making. This condition may also generate competency gaps as students advance to higher levels of education.

Mathematical problem-solving competence can develop optimally when effective interaction takes place between teachers and students, and when students are provided with regular problem-solving exercises (Hasanah et al., 2022). International studies have further confirmed that mathematical problem-solving skills serves as the cornerstone of higher-order mathematical competence. Schukajlow et al. (2023) asserted that problem solving is not merely a technical skill but rather a complex cognitive process encompassing metacognition, self-confidence, and the management of cognitive resources. This indicates that instructional approaches alone are insufficient; the cultivation of students' metacognitive awareness is equally necessary so that they can monitor and evaluate the problem-solving processes they undertake.

Various research results indicate that students' mathematical problem-solving skills are still relatively low, especially in solving non-routine problems that require higher-order thinking skills. This low skills is not only caused by a lack of mastery of mathematical concepts, but also by students' limitations in understanding information, selecting appropriate solution strategies, and reflecting on the process and results obtained. The findings in the previous paragraph indicate that mathematical problem-solving skills play a crucial role in the development of mathematical literacy and higher-order thinking skills. Therefore, a more in-depth study is needed to obtain a picture of students' mathematical problem-solving skills so that they can provide a foundation for developing more effective learning strategies that address students' needs.

Various previous studies have shown that students' mathematical problem-solving skills are still relatively low. These studies generally focus on students' general skills levels or factors that influence their mathematical problem-solving skills. However, research that analyzes students' skills in detail on each problem-solving steps, particularly on the topic of circles at the high school level, is still relatively limited. Furthermore, research on the

mathematical problem-solving skills of eleventh-grade students at SMA Negeri 1 Batang Anai has also been scarce. Therefore, this study aims to analyze the mathematical problem-solving skills of grade XI students at SMA Negeri 1 Batang Anai on topic of circles. The novelty of this study lies in the presentation of a profile of students' mathematical problem-solving skills based on Polya's problem-solving stepss through descriptive statistical analysis, thus providing a more detailed picture of students' skills on each problem-solving steps.

The problem-solving stages proposed by George Polya consist of four principal steps: (1) identifying and understanding the problem, (2) developing a solution strategy, (3) implementing the planned strategy, and (4) reviewing the solution obtained. These four steps serve as the primary analytical framework for evaluating students' answers in this study. According to Cai & Lester (2021), a problem-solving framework grounded in systematic stages such as Polya's remains pertinent in the context of contemporary mathematics education, as it provides a cognitive structure that assists students in approaching non-routine problems in an organized manner. The application of Polya's framework in this study is therefore expected to yield more comprehensive and well-structured data regarding problem-solving competence profiles of eleventh-grade students at SMA Negeri 1 Batang Anai, while simultaneously offering practical recommendations for teachers in designing more effective and purposefully directed learning activities.

Based on the description, the purpose of this study is to analyze the mathematical problem-solving skills of eleventh-grade students on the topic of circles. Theoretically, this study is expected to enrich the study of mathematical problem-solving skills and provide empirical information about student skills profiles that can be used as references for further research. Practically, the results of this study are expected to serve as evaluation material for teachers in identifying student skills and difficulties, thereby providing a foundation for the implementation of instructional strategies that can improve students' mathematical problem-solving skills.

METHOD

This research uses a quantitative descriptive approach with a descriptive research design. The quantitative descriptive method aims to describe a phenomenon based on numerical data obtained from measurements of the variables studied. The quantitative approach was chosen because this study aims to obtain an overview of students' mathematical problem-solving skills through the analysis of test results presented in

numerical form. The goals of this riset was to analyze students' mathematical problem-solving skills on the topic of circles. The data obtained were analyzed using descriptive statistics to provide a systematic and objective overview of the level of students' mathematical problem-solving skills based on the test results given (Sugiyono, 2023).

This research was conducted at SMA Negeri 1 Batang Anai involving 47 eleventh grade students from two classes as research subjects. Class selection was carried out using a purposive sampling technique with the consideration that both classes had studied the circle material and consideration of the time of the test. The research data were collected through a mathematical problem-solving skills test consisting of two descriptive questions on the circle material. The test instrument used was adapted from Aiga Dwi Yona's thesis entitled "The Effect of Problem-Based Learning Model with the Assistance of GeoGebra Media on the Mathematical Problem-Solving Skills of XI Grade Students at SMAN 1 Kec. Guguak". Before being used, the instrument had gone through a validation process by experts and had been proven valid, reliable and the questions were acceptable. All student answers were analyzed using descriptive statistics to obtain an overview of students' mathematical problem-solving skills. To strengthen the results of the analysis, four students were selected to be displayed and discussed as examples of problem-solving profiles.

The data analysis technique used in this study was descriptive statistics. Data obtained from the results of the students' mathematical problem-solving skills test were initially scored based on predetermined assessment guidelines. Next, the scores obtained by the students were calculated and analyzed to determine their level of mathematical problem-solving skills. Furthermore, the students' scores were grouped into specific skill categories to provide a clearer picture of their level of mathematical problem-solving skills. The results of the analysis were then presented in tabular and descriptive form, to provide systematic information about the students' skills in solving mathematical problems related to circles. Based on the analysis results, conclusions were drawn about the profile of the students' mathematical problem-solving skills, in accordance with the research objectives (Subhaktiyasa et al., 2025).

For the assessment of the test results, the researcher used a scoring rubric developed by Taufik et al. (2023), as shown in Table 1.

Table 1. Criteria for Scoring the Mathematical Problem-Solving Skills Test

Problem-Solving Steps	Score	Description
1. Understanding Problem	0	Does not write the known information and asked in the problem.
	1	Writes the known/asked information or mathematical model incorrectly.
	2	Successfully understands the problem comprehensively.
2. Planning Solution	0	Does not write a solution plan.
	1	Provides an incorrect order of solution steps.
	2	Provides a sequence of solution steps, but the order is not entirely appropriate.
	3	Provides a sequence of solution steps; however, it results in an incorrect answer.
	4	Provides a correct and well-ordered sequence of solution steps that leads to the correct answer.
3. Carrying Out Solution Plan	0	No answer is provided.
	1	Incorrectly carries out the solution plan.
	2	A solution is provided, but the procedure is unclear.
	3	Uses an appropriate procedure, but the answer is incorrect.
	4	Uses an appropriate procedure correctly and obtains the correct answer.
4. Reviewing /Checking the Solution Again	0	No answer is provided.
	1	Reviews the process and the answer inaccurately and provides an incorrect conclusion.
	2	Reviews the process and the answer accurately and provides a correct conclusion.

Source: Taufik et al. (2023)

The following are the categories of mathematics problem-solving skills, as shown in Table 2.

Table 2. Categories of Mathematical Problem-Solving Skills

Category	Score
Very High	$80 < N \leq 100$
High	$60 < N \leq 80$
Moderately High	$40 < N \leq 60$
Low	$20 < N \leq 40$
Very Low	$0 \leq N \leq 20$

Source: Risman et al. (2022)

RESULT AND DISCUSSION

Result

Based on the research data, two classes consisting of 47 Grade XI students at SMA Negeri 1 Batang Anai were given two essay questions based on problem-solving tasks

related to circle material. The resulting scores were then categorized according to the categories presented in Table 2. The results obtained are shown in Table 3.

Table 3. Categorization Results of the Problem-Solving Skills Test

Category	**Score**	**Total Students**	**Percentage(%)**
Very High	$80 < N \leq 100$	0	0
High	$60 < N \leq 80$	6	14,6
Moderately High	$40 < N \leq 60$	2	2,0
Low	$20 < N \leq 40$	19	43,8
Very Low	$0 \leq N \leq 20$	20	39,6

Next, the score data for each problem-solving step is presented in Table 4.

Table 4. Results of the Mathematical Problem-Solving Skills Test Based Steps Polya

Steps	Q No	Score					Mean	Skor Max	Total Students
		0	1	2	3	4			
1. Understanding Problem	1	3 6,4%	4 8,5%	40 85,1%	-	-	1,79	2	47
	2	31 66%	3 6,4%	13 27,7%	-	-	0,62	2	
2. Planning Solution	1	21 44,7%	15 31,9%	11 23,4%	0 0%	0 0%	0,79	4	47
	2	37 78,7%	9 19,1%	1 2,1%	0 0%	0 0%	0,23	4	
3. Carrying Out Solution Plan	1	20 42,6%	1 2,1%	20 42,6%	6 12,8%	0 0%	1,26	4	47
	2	39 83%	0 0%	1 2,1%	2 4,3%	5 10,6%	0,60	4	
4. Reviewing /Checking the Solution Again	1	36 76,6%	11 23,4%	0 0%	-	-	0,23	2	47
	2	40 85,1%	1 2,1%	6 12,8%	-	-	0,28	2	

Based on Table 3, the results of the categorization of mathematical problem-solving skills show that the majority of students are in the low and very low categories. No students reached the very high category (0%). There were 6 students in the high category (14.6%), while the medium category consisted of only 2 students (2.0%). Meanwhile, the low category was the category with the largest number of students, namely 19 students (43.8%), followed by the very low category with 20 students (39.6%). These results indicate that students' mathematical problem-solving skills is generally still relatively low because the majority of students are in the low and very low categories.

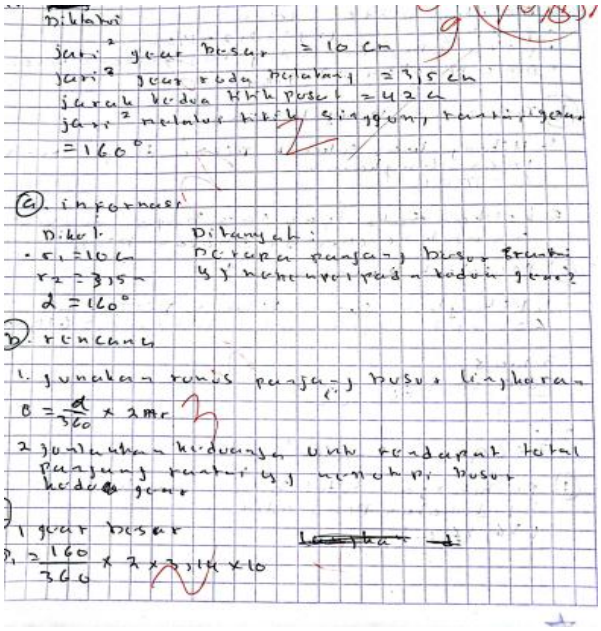
Based on Table 4, at the stage of understanding the problem, most students were able to complete the stepss in question number 1 well. This can be seen from 40 students

(85.1%) who obtained a score of 2, while 4 students (8.5%) obtained a score of 1 and 3 students (6.4%) obtained a score of 0. The average score obtained by students in question number 1 was 1.79 out of a maximum score of 2. However, in question number 2, students' skills decreased, where 31 students (66.0%) obtained a score of 0, 3 students (6.4%) obtained a score of 1, and only 13 students (27.7%) obtained the maximum score. The average score in question number 2 was only 0.62. In the planning stage of solving the problem, student performance was relatively low. On question 1, 21 students (44.7%) scored 0, 15 students (31.9%) scored 1, and 11 students (23.4%) scored 2. No students scored 3 or 4, resulting in an average score of only 0.79 out of a maximum of 4. A lower score was seen in question 2, where 37 students (78.7%) scored 0, 9 students (19.1%) scored 1, and only 1 student (2.1%) scored 2. The average score at this stage was only 0.23.

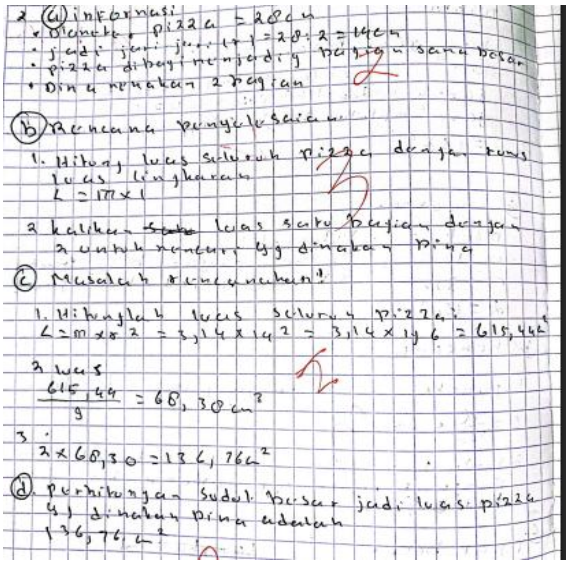
In the implementing the planning stage, student performance varied. On question number 1, 20 students (42.6%) received a score of 0 and 2, while 6 students (12.8%) received a score of 3 and 1 student (2.1%) received a score of 1. No student received the maximum score, resulting in an average score of 1.26. Meanwhile, on question number 2, 39 students (83.0%) received a score of 0, 1 student (2.1%) received a score of 2, 2 students (4.3%) received a score of 3, and 5 students (10.6%) received a score of 4. The average score obtained by students at this stage was 0.60. At the stage of reviewing the results of the solutions, most students did not demonstrate good skills. On question 1, 36 students (76.6%) scored 0 and 11 students (23.4%) scored 1, with an average score of 0.23 out of a maximum score of 2. Similarly, on question 2, 40 students (85.1%) scored 0, 1 student (2.1%) scored 1, and only 6 students (12.8%) scored 2. The average score for this stage was 0.28.

Overall, the problem-understanding stage was the stage with the highest achievement, especially on question 1, which was dominated by students who scored the maximum score of 85.1%. Conversely, the reviewing of the solution stage showed the lowest achievement, with over 75% of students scoring 0 on both questions. These results indicate that although some students were able to understand the problem, they still experienced difficulties in planning a solution strategy, implementing solution procedure correctly, and especially in reviewing their results.

One of the answers from a student in Class XI F1 who obtained the highest score is presented below.



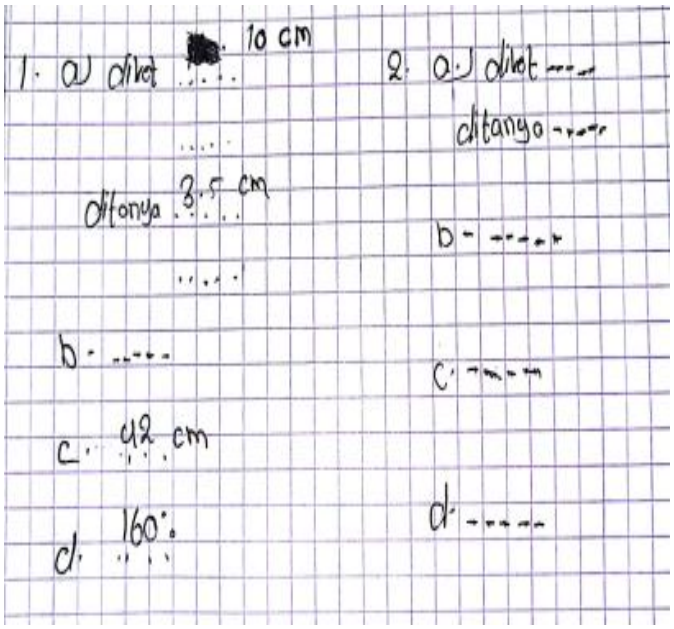
Picture 1. Student A Answer, Question 1



Picture 2. Student A Answer, Question 2

Based on the student's answer above, the student was able to understand the problem well and correctly. There were minor weaknesses in planning the solution and implementing the solution strategy. However, in the steps of reviewing or rechecking the solution, the student was already able to present it appropriately.

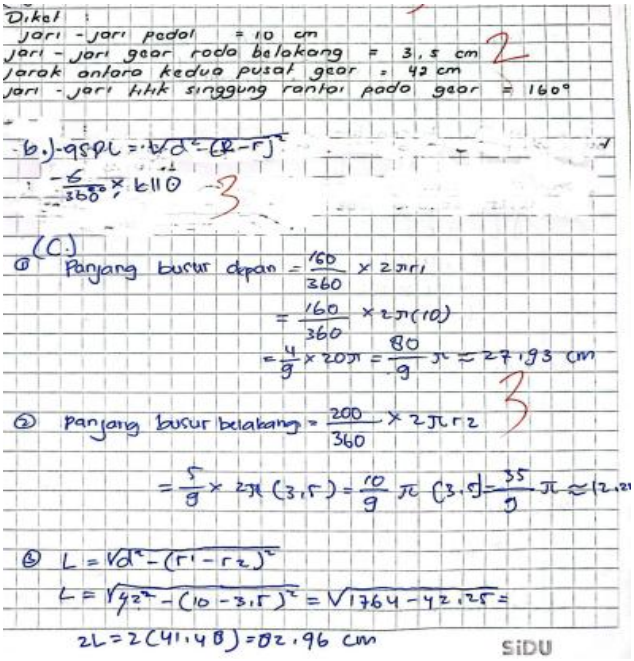
One of the answers from a student in Class XI F1 who obtained the lowest score is presented below.



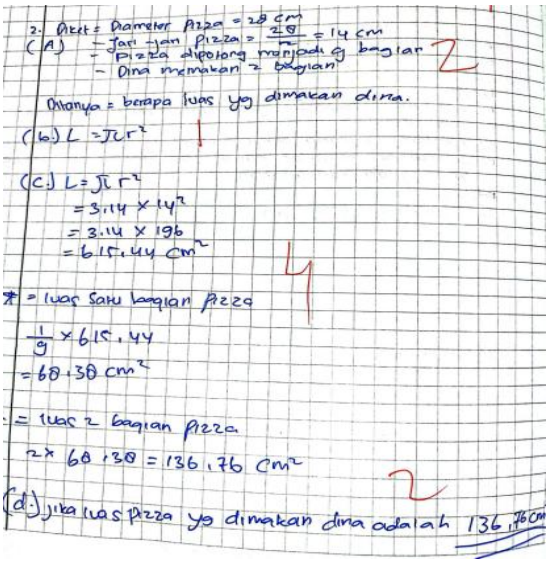
Picture 3. Student B Answer, Question 1 and 2

Based on the student's answer above, the student was unable to carry out the problem-solving steps properly, left the paper blank in several parts, and wrote answers carelessly without explaining where the numbers were obtained from.

One of the answers from a student in Class XI F7 who obtained the highest score is presented below.



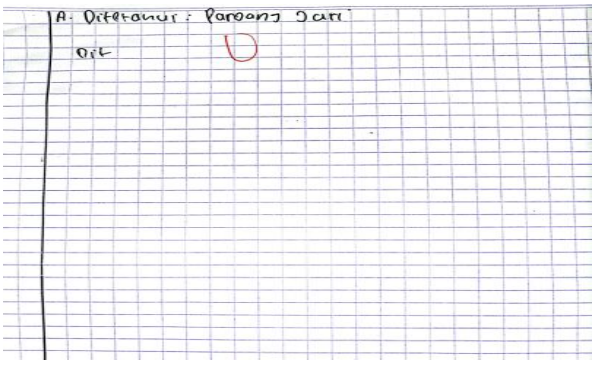
Picture 4. Student C Answer, Question 1



Picture 5. Student C Answer, Question 2

Based on the student's answer above, the student was able to understand the problem well and accurately. There were slight shortcomings in planning the solution and carrying out the solution plan. In the steps of reviewing/checking the solution again, the student was able to write it properly; however, in question number 1, the final result was inaccurate, so a score of 1 was given.

One of the answers from a student in Class XI F7 who obtained the lowest score is presented below.



Picture 6. Student D Answer, Question 1

Based on the student's answer above, the student was unable to carry out the problem-solving steps properly and left the paper blank. This student needs further guidance and support in order to improve their problem-solving skills.

Discussion

Based on the analysis of the mathematical problem-solving skills test, the majority of students still experience difficulties in solving problems on the topic of circles. This is evident from the predominance of students in the low (43.8%) and very low (39.6%)

categories, so that more than three-quarters of students have not demonstrated optimal problem-solving skills. Furthermore, the analysis of each steps shows that students' skills tend to decline on questions that require more complex understanding and reasoning. In the understanding problem steps, 85.1% of students obtained the maximum score on question number 1, but on question number 2, 66.0% of students obtained a score of 0. This difference indicates that students are relatively able to understand more familiar questions, but experience difficulties when having to interpret more complex information and connect it to concepts that have been learned. This condition indicates that students' understanding of the concept of circles is still procedural and not fully conceptual. This finding is in line with research by Wulandari and Fitrianna (in Nuraini & Ruqoyyah, 2023) which states that many students do not fully understand meaning of problem and therefore experience difficulties in determining the steps to solve it. In addition, Schukajlow et al. (2023) explained that students' problem-solving failures are often related to weak metacognitive control when facing unfamiliar problems.

Students' difficulties are increasingly evident in the planning steps for solutions. For question 1, 44.7% of students scored 0, while for question 2, that percentage increased to 78.7%. Results indicate most students are unable to determine the appropriate strategy before performing calculations. Based on student answer sheets, many students immediately use specific formulas without first analyzing the relationship between known information and the question being asked. As a result, the steps taken to solve the problem often do not lead to the correct solution. This pattern indicates that students are more accustomed to working on routine problems with demonstrated steps than on problems that require independent strategy selection. This finding is supported by Wijaya et al. (2022), who stated that a lack of opportunities to develop independent problem-solving strategies can impact students' low skills to solve mathematics problems.

In the steps for implementing the problem-solving plan, students' skills were also relatively low. 42.6% of students scored 0 on question 1, increasing to 83.0% on question 2. These results indicate that many students struggled to apply appropriate concepts and procedures, even though some had understood the information presented in the problem. The errors found generally involved the use of incorrect formulas, calculation errors, and the inskills to connect several circle concepts together. This indicates that students' conceptual understanding is not yet strong enough to be used in more complex problem-solving situations. These findings align with research by Husna & Purnama (2023), which

showed that difficulties in the initial stages of problem-solving can lead to errors in subsequent stages.

The steps with the lowest achievement was reviewing the solution. 76.6% of students scored 0 on question 1, increasing to 85.1% on question 2. These percentages indicate that most students did not review the steps or results. Based on student responses, many students stopped immediately after obtaining the calculation results without verifying the correctness of the procedures and answers. This situation indicates that students are not yet accustomed to reflecting on their own thought processes. However, the skills to double-check solutions is a crucial part of problem-solving because it can help students identify and correct potential errors. The results of this study align with Malikah (2023) findings, which state that students often skip the double-checking stage and write their final answers without verifying them.

When viewed by skills category, students in the high category able to meet almost all problem-solving stepss. They can identify relevant information, determine appropriate problem-solving strategies, and systematically implement the steps to obtain the correct answer. However, some students in this category are still inconsistent in writing conclusions and double-checking their results. Meanwhile, students in the moderate category are able to complete some problem-solving steps but are still less thorough in writing down important information and complete solution steps. This condition aligns with Windari's opinion (in Nuraini & Ruqoyyah, 2023) who stated that students often omit several problem-solving steps, reducing the accuracy of their solutions.

In contrast to the high and moderate categories, students in the low categories and very low categories generally only partially understand the information contained in the problem or are unable to fully understand the problem. Most students immediately perform calculations without a clear strategy, use inappropriate formulas, or provide no answers at all. This indicates that students lack the skills to think systematically when solving mathematical problems. These findings align with research by Hermawan and Hidayat (in Asoraya & Ruli, 2023), which showed that students' failure to solve math problems is often due to an inskills to determine appropriate thinking strategies. This research finding is also supported by Cai & Lester (2021), who stated that low-skills students tend not to conduct in-depth problem analysis before determining a solution strategy, resulting in poorly structured and inappropriate solutions.

Overall, the research results indicate that students' low mathematical problem-solving skills are not only caused by suboptimal conceptual mastery, but also by students'

low skills to plan strategies, implement solutions systematically, and evaluate the results obtained. This finding is in line with research by Irsyadi et al. (2022) which shows that students' skills in solving problems based on Higher Order Thinking Skills (HOTS) are still low, especially at the stages of defining problems and exploring solution strategies. Therefore, learning is needed that provides more opportunities for students to practice solving non-routine problems, develop reflective thinking skills, and develop problem-solving strategies independently. In line with this, Schukajlow et al. (2023) and Sari & Buchori (2024) recommend authentic problem-based learning because it can encourage active student involvement and improve mathematical problem-solving skills more optimally.

CONCLUSION

Based the results of study conducted on two classes of eleventh-grade, it can be concluded that students' mathematical problem-solving skills in the circle topic are still relatively low. This is indicated by the predominance of students in the low categories and very low categories. Based on the analysis of each problem-solving steps, students are relatively able to understand problems in more familiar questions, but experience difficulties when faced with problems that require deeper understanding and reasoning. The most prominent difficulties were found at the stages of planning solution, implementing solution plan, and reviewing the results of the solution. Most students were unable to determine the right strategy before performing calculations, still made errors in applying concepts and procedures for solving, and were not accustomed to reviewing the answers obtained. These findings indicate that students' mathematical problem-solving skills still need to be improved, especially in developing systematic and reflective thinking skills during the problem-solving steps. Therefore, learning efforts are needed that provide more opportunities for students to practice solving non-routine problems and develop problem-solving strategies independently.

RECOMMENDATION

Based the findings of this study, it is recommended to teachers provide students with more opportunities to practice solving non-routine problems that require problem-solving skills. Furthermore, learning should be designed in such a way that students can develop problem-solving strategies, systematically implement the steps, and review their

results. These efforts are expected to help improve students' mathematical problem-solving skills more optimally.

THANK-YOU NOTE

The author would like to convey deepest gratitude to SMA Negeri 1 Batang Anai and the mathematics teachers who assisted in conducting this research, as well as appreciation to the students who participated as respondents in this study.

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