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# ANALYSIS OF PROBLEM-SOLVING SKILLS OF STUDENTS CLASS XI IN TERMS OF SELF-CONFIDENCE

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***Abstract***

*This study aims to analyse and describe the ability of mathematical problem solving of the students' self-confidence in learning exponent and logarithm functions. This research uses a qualitative approach with a descriptive method. Data collection techniques are based on tests, self-confidence questionnaires, and interviews. The research subjects consisted if six students of class XI B. The results showed based on students with a high level of self-confidence have high problem-solving ability. Students who have a moderate level of self-confidence have a moderate category of problem-solving ability. Meanwhile, the percentage of students with low self-confidence levels has the low category of problem-solving ability. It concludes that there is a linear correlation between self-confidence level and mathematics problem-solving ability of grade XI students on exponent and logarithm functions.*

***Keywords****: Self-Confidence, Proble-Solving Ability, Mathematics.*

***Abstrak***

Penelitian ini bertujuan untuk menganalisis dan mendeskripsikan kemampuan pemecahan masalah matematika terhadap kepercayaan diri siswa dalam pembelajaran fungsi eksponen dan logaritma. Penelitian ini menggunakan pendekatan kualitatif dengan metode deskriptif. Teknik pengumpulan data menggunakan tes, angket kepercayaan diri, dan wawancara. Subjek penelitian terdiri dari enam siswa kelas XI B. Hasil penelitian menunjukkan bahwa siswa dengan tingkat kepercayaan diri tinggi memiliki kemampuan pemecahan masalah tinggi. Siswa yang memiliki tingkat kepercayaan diri sedang memiliki kemampuan pemecahan masalah kategori sedang. Sementara itu, persentase siswa dengan tingkat kepercayaan diri rendah memiliki kemampuan pemecahan masalah kategori rendah. Kesimpulannya adalah terdapat korelasi linier antara tingkat kepercayaan diri dengan kemampuan pemecahan masalah matematika siswa kelas XI pada fungsi eksponen dan logaritma.

**Kata Kunci**: Kepercayaan Diri, Kemampuan Pemecahan Masalah, Matematika.

## INTRODUCTION

Mathematics is one of the branches of science that has an important role, because it is closely related to the development of technology and knowledge, therefore, mathematics learning is given to students from elementary school to university levels. Mathematics is essential in daily life and complements other sciences (Pitria and Kurnia 2022). Among various disciplines, mathematics is a key component of national education goals (Ferdianto

and Yesino 2019). Mathematics education is critical for enhancing students' cognitive, affective, and motor skills.

Problem-solving is one of the core aspects of mathematics education. The National Council of Teachers of Mathematics (NCTM 2000) identifies problem-solving as one of five standard process skills students must master. Similarly, (Ulfa, Rahmi, and Revita 2019) state that problem-solving ability is one of the abilities that must be possessed in mathematics education. According to Hendriana in (Putri, Nasir, and Maharani 2022) states that Problem-Solving itself is a process where a person uses their knowledge, skills, and understanding abilities that are owned and resolve situations that have never been experienced. Problem-solving involves using knowledge, skills, and understanding that is owned and resolved with a situation that has never been experienced.

Student learning outcomes are an indicator of teaching success (Saihu 2020). However, in practice, students often lack confidence in answering mathematical questions. This issue stems from factors such as low interest in learning mathematics (Firnanda and Pratama 2020). Problem-solving ability is inseparable from learning activities, as success in facing challenges is closely tied to mathematics (Hermawati, Jumroh, and Sari 2021). Students' mathematical achievements can be assessed through tests measuring comprehension and mastery of material (Fatkhiyani, Kumala Dewi, and Munawaroh 2023).

One strategy to improve the achievement of student learning outcomes is through personality development, especially by fostering students' self-confidence. Yates, cited (Nurkholifah, Toheri, and Winarso 2018) emphasizes that self-confidence is crucial for success in learning mathematics. With self-confidence in students, they are more motivated and like mathematics. Lack of self-confidence can cause students to have difficulty in solving problems because they may not understand the necessary concepts, which ultimately results in them just guessing the solution without a deep understanding (Salamah et al. 2020).

## METHOD

This study is a qualitative research that uses descriptive methods. Qualitative research is research conducted in a particular setting in real life (natural) to investigate and understand phenomena: what happens, why it happens, and how it happen? This means that qualitative research is based on the concept of going exploring, which involves in-depth and case-oriented studies or a number of cases or single cases (Fadli 2021). This research involves the use of evaluation instruments that include tests and non-test. The instruments used in the study were self-confidence questionnaires and test questions in the form of test questions on exponent and logarithm functions. The first is a few days before the tst, the researcher submitted a self-confidence questionnaire consisting of four indicators with four answer choices, namely scoring 1, 2, 3and 4. 1 for the answer Strongly Disagree, 2 for the answer Disagree, 3 for the answer Agree and 4 for the answer Strongly Agree. In the questionnaire, there are 30 questions, and then based on the results of the questionnaire, the researcher can make a group which students who are included in the category of students who have High, Medium, and Low self-confidence levels. Self-

confidence consists of four indicators, namely a) Believe in one's own abilities; b) Act independently in making decisions; c) Date to express opinions during discussions; d) Dare to face challenges. (Dalilan and Sofyan 2022).

The data analysis technique for non-test instruments uses a Likert scale. For positive statements, a score of 4 is interpreted as Strongly Agree, 3 as Agree, 2 as Disagree, and 1 as Strongly Disagree, and vice versa for negative statements. In this study, researchers classified students based on self-confidence levels using the self-confidence classification as listed in the following table.

**Table 1**. Classification of self-confidence level

| Classification of Self Confidence | Level |
|---|---|
| $x \geq (\bar{x} + SD)$ | High |
| $(\bar{x} - SD) < x < (\bar{x} + SD)$ | Medium |
| $x \leq (\bar{x} - SD)$ | Low |

Source: (Ulfa et al. 2019)

Then for the test consists of eight questions on Exponent and Logarithm Functions. Researcher divide the questions into five types of questions, namely Type A,B, C, D, and E. Each of which has the same level of difficulty, but with different numbers. Based on the test scores, students were categorised into the three groups, namely students with high, medium, and low mathematical problem-solving skills. The test instrument was processed by adding up the scores of each question according to the predetermined weight, then analysed descriptively based on the students' self-confidence level. The grouping of learning outcomes refers to the rating scale according to Ratumanan and Laurens in (Jayanti and Julianingsih 2021), which is determined as follows.

**Table 2**. Category of Students' Mathematics Problem Solving Ability

| Scale | Category |
|---|---|
| $85 < score \leq 100$ | High |
| $75 < score \leq 85$ | Medium |
| $0 \leq score \leq 75$ | Low |

Research Subsject for this research is Students of class XI B SMA Negeri 6 Semarang became the subject of this study with a total of 36 students. Then 6 students were selected based on the category og high, medium, and low self-confidence category using Purposive Sampling, the purpose of which was that the researcher wanted to examine the effect of self-confidence on mathematical problem-solving ability.

## RESULTS AND DISCUSSION

### Results

The description of students' self-confidence is obtained based on the score of each student, based on filling out the self-confidence scale. All student answer sheets from the results of the Self-Confidence questionnaire were collected to be checked and scored. Scoring each student's answer is based on the Self-Confidence scale scoring guidelines. After obtaining the students' Self-Confidence data, the researchers grouped the Self-

Confidence data into high, medium, and low categories, adopted from (Wijayanto and Istianah 2013), with the following display:

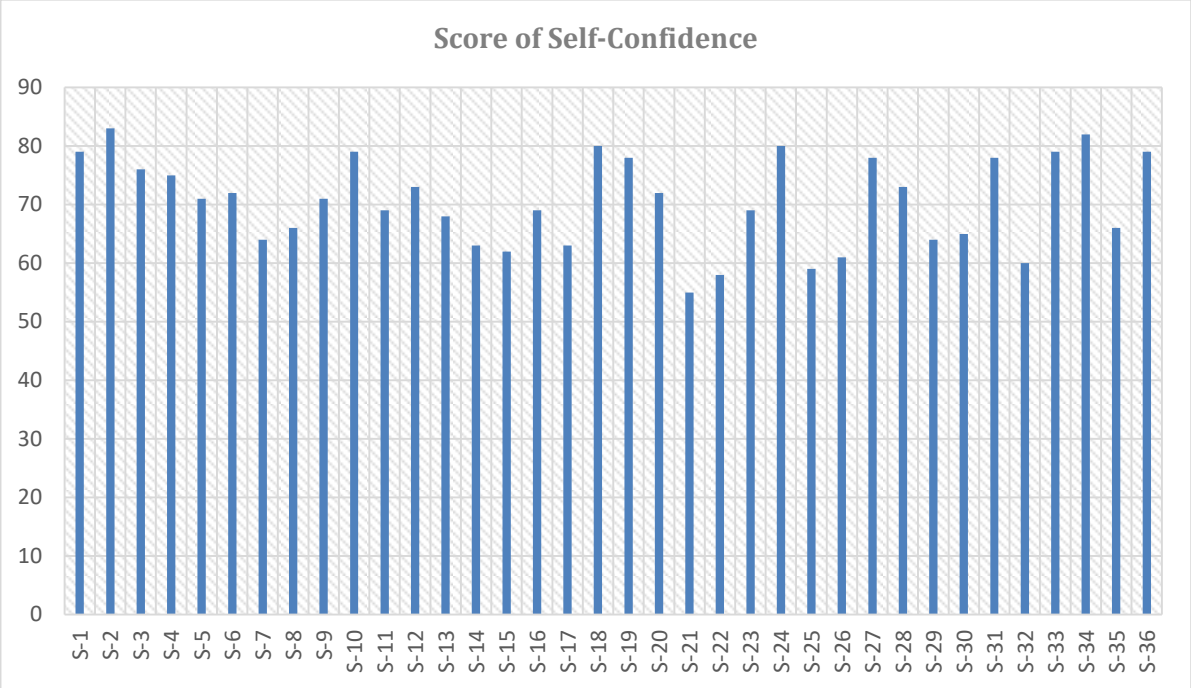


**Figure 1.** Self-confidence of XI B class

**Table 3.** Calculated results of Student Self-Confidence Data Grouping

| | |
|---|---|
| Mean | 70,527 |
| Variant | 59,342 |
| Standard Deviation | 7,703 |
| Min | 55 |
| Max | 83 |
| Mean – SD | 62,824 |
| Mean + SD | 78,231 |

Based on the table above, it is found that the average value of students' self-confidence level is at a score of 70.527 with a standard deviation of 7.703. With a maximum score of 83 and a minimum of 55. Based on the category of student self-confidence, based on scores above the mean + standard deviation, then it is a score for high self-confidence, and if it is below the mean - standard deviation then it is in the low self-confidence category. From the distribution of the results above, three categories of self-confidence are determined, consisting of High, Medium, and Low, by paying attention to Table 1 above.

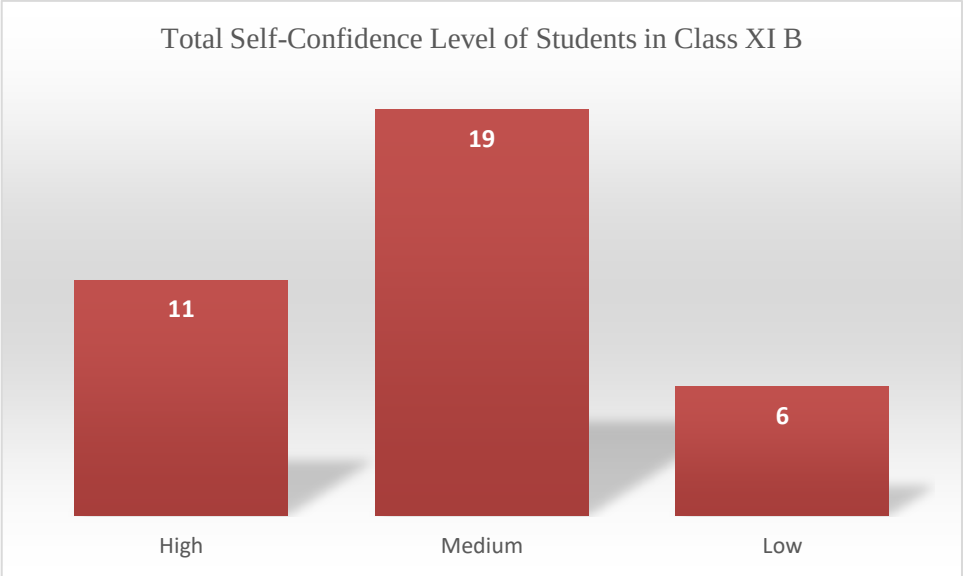


**Figure 2.** Students' self-confidence level

After obtaining 3 categories of students' self-confidence, then given the Mathematics Problem-Solving Ability test questions were given based on the Exponent and Logarithm Function Material. As a result of the Mathematics Problem-Solving Ability Test Value and the following data were obtained.

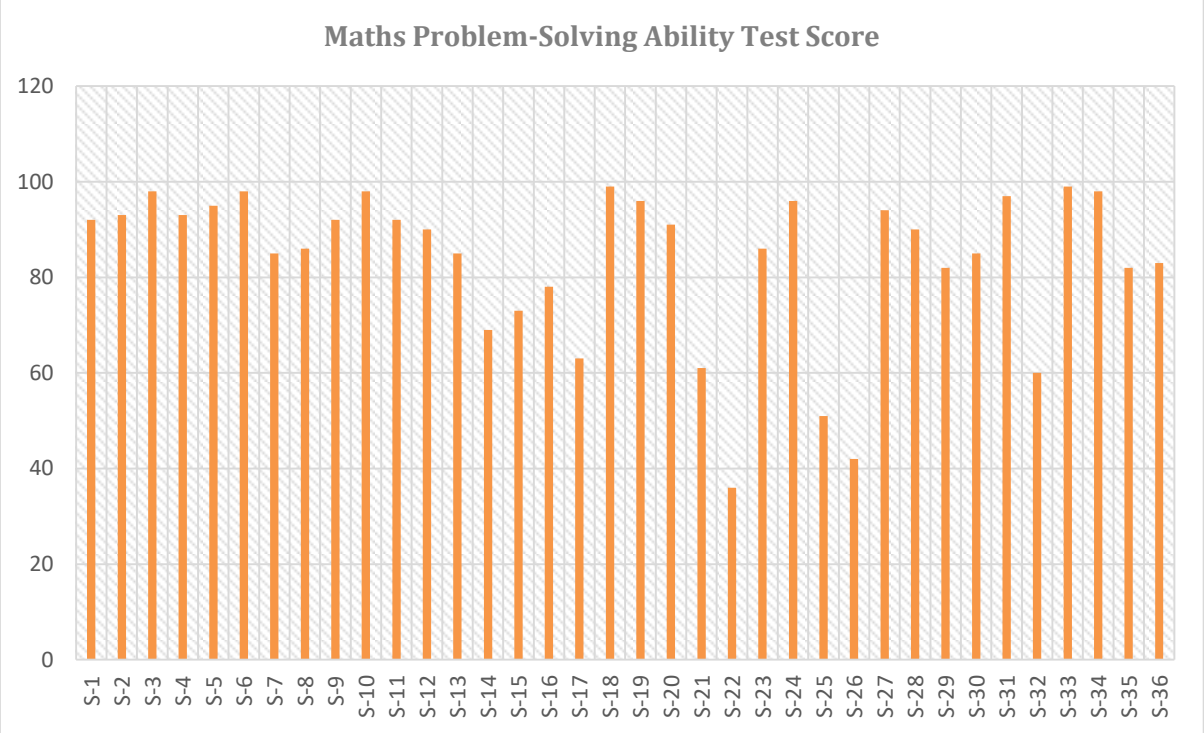


**Figure 3.** Data on Mathematics Problem-Solving Ability of Students in Class XI B

Based on the Figure above, the class average score of the test result is 83,56. Then the criteria for students with High, Medium, and Low Mathematical Problem Solving Ability are as follows:

**Table 4.** Category of Mathematical Problem Solving Ability

| Category of Maths Problem Solving Ability | Total |
|---|---|
| High | 21 |
| Medium | 7 |
| Low | 8 |

Then, after determining the number of students with high, medium, and low levels of self-confidence categories and already displaying the Mathematics Problem Solving Ability Data. Then, the following is the average score of students' mathematics problem-solving ability that has been determined based on the level of self-confidence.

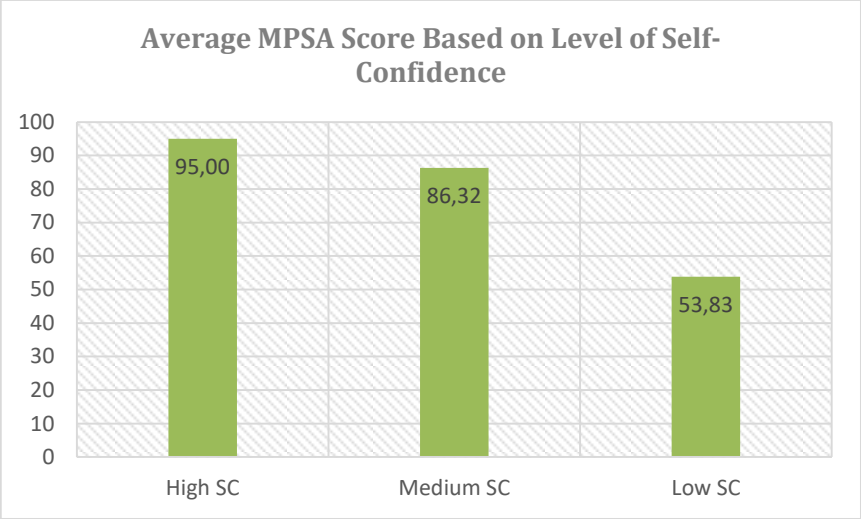


**Figure 4.** Average Data of Students' Mathematics Problem-Solving Ability Based on Self-Confidence Level

After obtaining 3 categories of self-confidence levels and Mathematical Problem Solving Ability data, the researcher selected 6 subjects to explore more information about how much influence the level of self-confidence of students has on mathematical problem-solving ability. Below is a description of problem solving using Polya's indicators of student mathematical problem-solving, quoted from (Chang 2010). The following is a table to identify the effect of self-confidence on problem-solving ability:

**Table 5.** Mathematics Problem Solving Ability of Students with High Self-Confidence

| MPSA measures | S-2 | S-36 |
|---|---|---|
| 1 | Able to write and mention the parts of what is known and stated in detail | Able to write and mention the parts that are asked and known completely and correctly |
| 2 | Able to write/create a mathematical model correctly and completely | Able to write/create a mathematical model correctly and completely |

| | | |
|---|---|---|
| 3 | Able to use the method that has been chosen and operate it correctly, although there is a slight error in the calculation to obtain less precise results | Able to use the method that has been chosen and operate it correctly, although there are some miscalculations to obtain less precise results |
| 4 | Able to make conclusions and look back at the overall answer from the answers she has obtained | Able to make conclusions and look back at the overall answer from the answers he has obtained |
| Conclusion | 1. Able to understand the problem<br>2. Able to plan<br>3. Able to implement the solution plan<br>4. Able to look back at the answer from the whole | |

Mathematical Problem Solving Ability with High Self-Confidence Level, based on the test results for S-2 High Problem Solving Ability (Score 93), while for S-36 Moderate Problem Solving Ability (Score 83). Then the following conclusions can be drawn:

(1) Understanding the Problem: Subjects S-2 and S-36 have shown good ability in understanding the problem. This can be seen from their ability to mention and write down the known information from the problem correctly and correctly. In addition, both were also able to identify and write what was asked in the problem accurately. This shows that S-2 and S-36 have fulfilled the first indicator of problem solving according to Polya.

(2) Developing a Plan: These two subjects have also managed to develop a solution plan well. Both of them were able to make a memorisation and formulate a mathematical model of the problem completely, although there were still some errors in calculating. Thus, S-2 and S-36 have fulfilled the second indicator of problem solving according to Polya.

(3) Implementing the Solution Plan: S-2 and S-36 were able to choose the right method to solve the problem. Both of them were also able to explain the steps of the method used in detail, resulting in an appropriate answer. This shows that both of them have fulfilled the third indicator of problem solving according to Polya.

(4) Looking Back at the Answer as a Whole: Subjects S-2 and S-36 have done this step well. Both of them were able to re-examine the answers they had done and draw the right conclusions.

Thus, it can be concluded that both of them have fulfilled the fourth indicator of problem solving according to Polya.

**Table 6.** Mathematics Problem Solving Ability of Students with Moderate Self-Confidence

| MPSA measures | S-20 | S-16 |
|---|---|---|
| 1 | Able to write and mention the parts of what is known and what is asked correctly | Less Able to mention the elements of what is known and what is asked |

| | | |
|---|---|---|
| | | correctly |
| 2 | Able to write/create a memorisation and mathematical model correctly | Able to write/create a memorisation and mathematical model correctly |
| 3 | Able to use the method that has been chosen and operate it correctly, but some are still inaccurate in calculating | Less able to use the method that has been selected or planned and less able to operate correctly and completely, so there are still some that have calculation errors, so the subject gets less than optimal results |
| 4 | There were some questions that were not drawn, thus reducing the score on the test | Able to make conclusions and look back at the overall answer from the answers she has obtained |
| Conclusion | 1. Less able to structure the problem<br>2. Able to plan<br>3. Less able to implement the solution plan<br>4. Slightly less able to look back at the overall answer | |

Mathematical Problem Solving Ability with Moderate Self-Confidence Level, based on test results for S-20 High Problem Solving Ability (Score 91), while for S-16 Moderate Problem Solving Ability (Score 78). Then the following conclusions can be drawn:

(1) Understanding the problem: Subject S-16 was less able to understand the problem well. However, for S-20 it is good enough. At this stage, S-16 was less able to mention and make the known and questionable elements complete in the problem. Then for S-20 there is a little incomplete in mentioning the problem. Thus, subjects S-20 and S-16 are still unable to fulfil the indicators of one problem solving according to Polya.

(2) Developing a plan: Subjects S-16 and S-20 have both been able to carry out the preparation of the plan well. S-20 and S-16 were also able to make memorisation and mathematical models of the problems in the problem, completely and correctly. Thus, both of them have been able to show and fulfil the indicators of two problem-solving approaches according to Polya.

(3) Implementing the solution plan: S-20 has been able to determine the method used correctly, but there is still a slight error in determining the right answer. However, S-16 was less able to determine or use the right method, and there were errors in counting, and also still not able to fully explain the steps of the method used in the process of implementing the solution plan to produce an incorrect answer. It can be said that subjects S-20 and S-16 were less able to fulfil the three indicators of problem solving according to Polya.

(4) Looking back at the overall answer: Subject S-16 has done this step quite well, but for S-20. They are still not using this step. But overall, both of them have re-examined the overall answer that has been done and are able to make a conclusion that is obtained appropriately.

Thus, it can be said that subjects S-16 and S-20 are sufficient to fulfil the four indicators of problem solving according to Polya.

Table 7. Mathematics Problem Solving Ability of Students with Low Self-Confidence

| MPSA measures | S-22 | S-26 |
|---|---|---|
| 1 | Not able to determine what is known and asked completely | Not able to determine what is known and asked completely |
| 2 | Unable to make permissiveness and mathematical models correctly and completely | Unable to make permissiveness and mathematical models correctly and completely |
| 3 | Unable to implement the solution plan of the method used correctly | Unable to implement the solution plan of the method used correctly |
| 4 | Unable to make a correct conclusion and did not check the answer again | Unable to make a correct conclusion and did not check the answer again |
| Conclusion | 1. Not able to understand the problem<br>2. Not able to plan<br>3. Unable to implement the solution plan<br>4. Unable to look back at the answer from the whole | |

The ability to solve maths problems with a low level of self-confidence, based on the test results, shows that S-22 (Score 36) has low problem-solving ability, while S-26 has low problem-solving ability (Score 42). From these results, the following can be concluded:

(1) Understanding the Problem: Neither S-22 or S-26 was able to understand the problem well. Both of them had difficulty in mentioning and writing the known elements and the question completely and accurately. This shows that S-22 and S-26 did not fulfil the first indicator of problem solving according to Polya.

(2) Developing a Plan: Both subjects also failed to plan well. They were unable to make and explain assumptions and appropriate mathematical models. As a result, they did not fulfil the second indicator of problem-solving according to Polya.

(3) Implementing the Solution Plan: S-22 and S-26 were unable to implement the solution plan effectively. Both failed to apply the steps of the method used, so the results obtained were inaccurate. Thus, they did not fulfil the third indicator of problem solving according to Polya.

(4) Looking Back at the Overall Answer: At this stage, S-22 and S-26 did not re-examine their answers. Since both of them were unable to complete the previous steps correctly, they also did not do any rechecking or draw appropriate conclusions.

From what is explained above, it shows that S-22 and S-26 did not fulfil the fourth indicator of problem solving according to Polya.

**Discussion**

Based on the description above, which is based on the results of the Mathematics Problem Ability test on Exponent and Logarithm Functions, it is found that students who have a high level of Self-Confidence are more able to fulfil all the indicators that exist in Polya's Problem Solving ability, Students with a Moderate level of Self-Confidence are only able to fulfil the indicators of Problem Solving Ability on the indicators of Being able to Develop a Plan and Slightly Less Able to see the Answer Back, while for Students with a Low level of Self-Confidence are unable to carry out all indicators of Mathematical Problem Solving according to Polya. This is in line with (Yulinawati and Nuraeni 2021) who state that High Self-Confidence, students can have a positive attitude towards Mathematics, are more able to appreciate everything they own in themselves, so that students will be confident and optimistic in working on mathematics problems. Other than that, according to (Ramdani et al. 2021) that self self-confidence is very important in supporting the success of mathematics learning. With self-confidence, students will not be easily influenced by other people's answers and increase their love for learning mathematics so that their achievement is maximised (Hendriana et al., 2017).

Based on the test results, the average mathematics problem-solving ability of students in class XI B SMA Negeri 6 Semarang is 83,56. By capitalising on high Self-Confidence, students tend to be more able to plan problem-solving strategies appropriately and correctly. This is evidenced by students who have a high level of Self-Confidence; the average score on the test is 95,00, which means that the results are close to perfect. This is in line with (Maulidya and Nugraheni 2021), who state that students with high Self-Confidence levels will get high mathematics learning outcomes.

Self-confidence is one of the factors to support problem solving, self-confidence that believes that he is capable when given a problem that is complicated, impossible, and contextual, which can affect the results of solving the problem (Triana and Rahmi 2021). For students in the low Self-Confidence category, students have not been able to fulfill the indicators of Mathematics Problem Solving, and students who have a low level of Self-Confidence, their problem-solving ability is also low. This is in line with Nurfauziah that people who have low self-confidence are not used to feeling afraid or uncomfortable when they get out of their comfort zone and will avoid the threat (Fitayanti, Rahmawati, and Asriningsih 2022). In line with (Fardani, Surya, and Mulyono 2021), who state that students in the Low Self-Confidence category, students have difficulty in the concept and problem-solving categories.

One of the factors that causes students' low self-confidence is their fear of expressing opinions and the tendency to make conclusions without trying first. (Asdar, Arwadi, and Rismayanti 2021). In line with (Salamah et al. 2020) who stated that a lack of confidence will cause students to be unable to solve problems due to not understanding the concept, so they just guess the solution to the problem given. So that this will have an impact on student learning achievement that is not optimal. Based on this, it can be concluded that self-confidence is very important for students to have so that they are able to optimise their potential, increase motivation, and sharpen intelligence, so that the learning outcomes achieved can be maximised.

## CONCLUSION

The level of self-confidence that exists in students is one of the things that has a positive influence on students' mathematics problem-solving ability. Students who have a high level of self-confidence tend to achieve higher mathematics learning outcomes. This is based on the average score for students with high Self-Confidence is 95.00. Students with moderate self-confidence were 86.32, and students with low self-confidence were 53.83. It is concluded that there is a linear correlation between self-confidence level and mathematics problem-solving ability of grade XI students on exponent and logarithm functions.

In addition, several other factors affect students' mathematical problem-solving ability, including errors in the calculation process due to lack of accuracy and caution when working on problems, lack of understanding of problems and material concepts because students do not repeat lessons independently, tendency to give up easily when facing problems that are difficult or different from those usually given, and errors in choosing the right method or way of solving.

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