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# Analysis of Student's Mathematical Problem Solving Ability on HOTS Questions at MTS Ar-Raudhatul Hasanah Medan

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**Abstract**

This research aims to analyze students' mathematical problem solving abilities in Higher Order Thinking Skills (HOTS) on lines and angles. The research method used was descriptive analytical with the research subjects being class VIII students at MTs Ar-Raudhatul Hasanah Medan. Data was collected through a mathematical problem solving test with a focus on the HOTS aspect, namely providing a series of HOTS questions specifically designed to explore students' skills in dealing with complex aspects of Lines and Angles. The research results show that students show various levels of proficiency in solving complex problems that require critical thinking and in-depth understanding of line and angle material and that most students still experience difficulty in answering questions that require the application of HOTS. The implication of this research is to improve the mathematics curriculum at MTs Ar-Raudhatul Hasanah Medan by including more HOTS elements. This may include improvements to curriculum structure, emphasis on HOTS concepts, and integration of teaching methods that support the development of high-level problem solving

**Keywords:** *Student abilities, mathematical problems, HOTS Questions*

## Introduction

One of the abilities that students must master in learning mathematics is mathematical problem solving. This is in line with the research results of Nur et al., (2022) and Khusna et al., (2024) which revealed that the subject that is effectively used in the problem solving process is mathematics. Problem solving ability is a way to solve problems in everyday life to achieve desired goals. This ability must be possessed by every student in order to understand, apply and determine appropriate and coherent strategies in solving a problem. Other research Sutama et al., (2022) and Pratiwi et al., (2022) also revealed that it is hoped that students can apply problem solving abilities in mathematics learning from what they have learned in everyday life.

Mathematics education is an integral part of building students' cognitive capacity and analytical skills (Afikah et al., 2023; Amilia & Rahaju, 2022; Gaol et al., 2024; Kliziene et al., 2022; Putri et al., 2019; Rahayuningsih et al., 2020). One of the goals of mathematics education is to develop students' problem solving abilities. In this case, *Higher Order Thinking Skills* (HOTS) is an important focus, considering the need for critical and creative thinking skills in facing mathematical challenges in everyday life (Mahyastuti et al., 2021; Mukuka et al., 2021; Tanudjaya & Doorman, 2020). HOTS questions are very important for developing mathematics learning and being able to solve existing problems (Bakry & Bin Bakar, 2015). However, with a high cognitive level which is an indicator of HOTS, it does not rule out the possibility that students will experience difficulty in solving HOTS type questions (Sadijah et al., 2021).

In the mathematics learning process, solving mathematical problems is the main focus, however in Indonesia students' ability to solve mathematical problems is still considered low. The results of the *Trends in International Mathematics and Science Study* (TIMSS) show that

evaluation of student achievement in the cognitive domain includes three aspects, namely understanding, application and reasoning ability (Hadi & Novaliyosi, 2019). Related to this, it can be seen from the results of the 2015 TIMSS research that students' abilities in mathematics in Indonesia are still below international standards. The average achievement of Indonesian students in mathematics reaches 397, while the average international standard is 500. Thus, Indonesia is ranked 44th out of 49 countries involved in the study (Nizam, 2016).

One of the reasons for the low achievement of students is that the learning process in Indonesia in general is not yet HOTS based. Meanwhile, the questions used in the TIMSS and PISA tests are questions in the HOTS category. These questions require students' ability to reason and solve mathematical problems which are tested as a tool to measure students' mathematical literacy abilities (Cahyani et al., 2022; Prabowo et al., 2023; Suprapto et al., 2023). HOTS is part of the thinking skills contained in the cognitive realm of Bloom's Taxonomy which aims to sharpen mental abilities around knowledge. This explanation is in line with Conklin (2012) statement that HOTS involves critical thinking and creative thinking skills. HOTS in the realm of Bloom's Taxonomy includes three high-level abilities, namely analyzing, evaluating and creating. Strengthening this statement, Brookhart (2010) evealed that HOTS consists of the ability to think logically and also logic and reasoning, analysis skill, evaluation, creation, problem solving skills, judgment skills.

The results of research on the use of HOTS in mathematics learning, namely research by Sulistyani et al., (2021) revealed that HOTS-based mathematics learning design through activities in the introductory activities, the application of HOTS is seen in apperception and motivation activities, the application of HOTS in the core of learning is done by giving problems or problems with HOTS levels, applying problem-based learning, using props, pictures, graphs, games and other media to find concepts, and asking questions by asking questions that stimulate students to think critically. In the closing activities, HOTS activities are seen in drawing conclusions and assigning projects. Furthermore, Saraswati & Agustika (2020) research revealed that students are advised to practice working on HOTS-type math problems, especially problems with the creation level (C6) and in the form of contextual problems or problems related to everyday life. This is intended so that students are accustomed to being able to solve diverse math problems. Students are expected to get used to solving problems coherently from understanding the problem, planning the solution, implementing the plan, and looking back at the correctness of the problem solving. For teachers, teachers are advised to know students' abilities in solving HOTS-type math problems so that they can design and conduct learning that can improve these abilities. In addition, teachers should more often provide additional tasks or practice HOTS problems. Teachers are advised to instill the concept of material well and coherently, as well as in terms of instilling concepts regarding the strategy for solving a math problem. Teachers are expected to accustom students to working on HOTS-oriented math problems in a coherent manner from understanding the problem, planning the problem solving, implementing the plan, and reviewing the correctness of the problem solving. So that when students find various kinds of math problems, students can solve them properly and correctly. Another study by Hasyim & Andreina (2019) also revealed that the analysis of students' HOTS in solving open ended problems on the subject of Three-Variable Linear Equation Systems in class X students of SMA Negeri 2 Trenggalek that HOTS students with high abilities were able to fulfill the indicators of analyzing, evaluating, and creating HOTS students with moderate abilities were able to fulfill the indicators of analyzing and evaluating; and HOTS students with low abilities were able to only fulfill the indicators of analyzing, and could not be said to fulfill the indicators of evaluating and creating.

The learning process carried out by teachers also needs to be directed to support the formation of students who are able to think logically, critically and creatively (Arifuddin, 2019; Pamungkas et al., 2019; Supratman et al., 2023; Wahyudi et al., 2020). Where Mathematics in terms of high level thinking abilities can be said to be still relatively low. This statement is in line with Irmawati et al., (2021) and Säfström et al., (2023) who revealed that students still have low mastery of the material and have difficulty answering questions that require reasoning. This is because students tend to just memorize or memorize existing formulas so that without realizing it, students don't understand the concept. So, when given various questions with the same mathematical concept, many students are still confused about solving them and find it difficult.

Lines and Angles material has a significant role in the mathematics curriculum. Understanding the concepts of lines and angles becomes the basis for further problem solving in mathematics. Therefore, it is important to analyze students' mathematical problem solving abilities on HOTS questions related to this material. However, more in-depth research regarding students' mathematical problem solving abilities regarding HOTS in the context of Lines and Angles material is still limited.

Based on the results of an interview with one of the mathematics teachers at MTs Ar-Raudhatul Hasanah Medan, information was identified that there were many obstacles for students in solving HOTS questions. This is because students do not master the concept, where students still use formulas incorrectly and determine formulas incorrectly. Then students do not master the prerequisite knowledge. Where prerequisite knowledge is the knowledge needed to learn new teaching material.

Research on the analysis of students' mathematical problem solving ability on HOTS questions at MTs Ar-Raudhatul Hasanah Medan is very important because it provides valuable insights in several aspects of education. First, it helps schools in evaluating the effectiveness of the mathematics curriculum they implement. By understanding the extent to which students are able to solve HOTS problems, schools can assess the success of curriculum implementation and make necessary improvements. Second, this research is also important for learning development. The results of the analysis of students' ability to solve HOTS problems can be the basis for designing learning strategies that are more effective in improving students' mathematical problem solving skills. Teachers can use the findings of this study to adjust their learning approaches to make them more relevant and challenging for students. In addition, analyzing students' mathematical problem solving skills also provides a useful mapping of students' learning achievements. By knowing students' level of ability in solving HOTS problems, schools can identify areas where students may have difficulties and provide appropriate interventions. Lastly, this research can also contribute to knowledge in the field of mathematics education more broadly. The findings of this study can be a reference for other researchers in developing new methods or theories in measuring and improving students' mathematical problem solving skills. Thus, this research has a significant impact not only for MTs Ar-Raudhatul Hasanah Medan, but also for the development of mathematics education in general.

This research was conducted to explore students' mathematical problem solving skills, especially in the context of HOTS questions related to Line and Angle materials. This is important because it provides an in-depth understanding of the extent to which students are able to apply geometry concepts in more complex and abstract situations. HOTS problems related to Lines and Angles extend the boundaries of students' thinking and challenge them to solve problems in more complex ways. By studying students' ability to solve these types of problems, we can evaluate the extent to which they are able to face higher mathematical challenges. In addition, Line and Angle materials have broad relevance in mathematics and other related sciences. The

ability to understand and apply geometry concepts is not only important in academic contexts, but also in everyday life and careers in various fields.

Through in-depth analysis of students' mathematical problem solving abilities, it is hoped that the results of this research can make a real contribution to the development of mathematics education at the primary and secondary education levels. A better understanding of the challenges students face in solving mathematical problems can be the basis for designing more effective and relevant learning programs. The purpose of this research is to find out how students' abilities are in solving problems related to line and angle material in HOTS questions at MTs Ar-Raudhatul Hasanah Medan.

## Method

This type of research is qualitative research. It is said to be qualitative research because this research seeks to reveal symptoms as a whole in accordance with the context through data collection in a natural setting with research as the main instrument and more realize the process and meaning from the point of view of the research subject. This research is descriptive and tends to use analysis with an inductive approach that emphasizes process and meaning. The research aims to describe current events or events. The process can attempt to describe, record, and interpret events that are currently happening.

This research will be selected research subjects of class VIII students of MTs Ar-Raudhatul Hasanah Medan. Determination of research subjects using tests that will be given to 1 class of 27 students. While the way of taking research subjects is done by using Nonprobability Sampling technique. The research procedures carried out in this study include, preliminary studies, design development, research implementation, report writing. The research instrument used in this research is the researcher himself as the main instrument in collecting data, and assisted by supporting instruments. In addition, it is also equipped with Higher Order Thinking Skill (HOTS) type math questions. The supporting instruments include: (1) Mathematics Ability Test (MCT). The Mathematics Ability Test is a test that aims to determine the level of students' mathematical abilities, (2) Mathematics Problem Solving Test (TPMM) questions on line and angle material. The math problem solving test aims to find out problem solving in students, (3) Interview guidelines. In the form of questions to extract information from students related to students' problem solving skills.

## Results

The results of the analysis of students' mathematical problem solving ability on Higher Order Thinking Skills (HOTS) questions on line and angle material to 27 students in class VIII B. The results of the questions were analyzed by researchers and grouped according to the level of low, medium and high student categories. This was done based on indicators of mathematical problem solving on HOTS questions. The following are the results of the analysis of students' mathematical problem solving on HOTS questions in Table 1:

**Table 1.** TKM category based on Rating scale

| No. | Math Proficiency Level | Number of Students | Value Range |
|---|---|---|---|
| 1. | High | 7 | 100 N ≤ 80 |
| 2. | Medium | 14 | 80 N ≤ 65 |
| 3. | Low | 6 | N ≤ 65 |

Table 1 shows that the students who got the highest score were 7 students, moderate 14 students and low 6 students. The sample given was represented by 1 student for each level of students' mathematical ability, 1 student for the highest score, 1 student for the medium score and 1 student for the lowest score. Furthermore, interviews were conducted with 3 students who were used as research subjects. The following are the names of the research subjects in Table 2:

**Table 2**. Research Subject

| No. | Subject Name | Category |
|---|---|---|
| 1. | MH | ST1 |
| 2. | ZA | ST2 |
| 3. | EO | ST3 |

Table 2 shows that the number of test scores of students in class VIII B who became research subjects in completing the test of students' mathematical problem solving ability on *Higher Order Thinking Skills* (HOTS) questions on line and angle material, from the three students as the focus of the research discussion, the following analysis was obtained:

***MHM students' achievement in answering Higher Order Thinking Skills (HOTS) questions on line and angle material***

Analyze

This section analyzes the achievement of indicators of students' mathematical problem solving ability on *Higher Order Thinking Skills* (HOTS) questions on line and angle material. The analysis was conducted on the six research subjects. In relation to mathematical problem solving, the indicators used are: (1) Understand the problem, (2) Develop a solution plan, (3) Solve the problem according to the plan, (4) Recheck. Each indicator is given a symbol, among others: activities to understand the problem (P1), activities to develop a solution plan (P2), activities to solve problems according to plan (P3), and activities to check back (P4). Description of the achievement of indicators of mathematical problem solving ability of research subjects, namely:

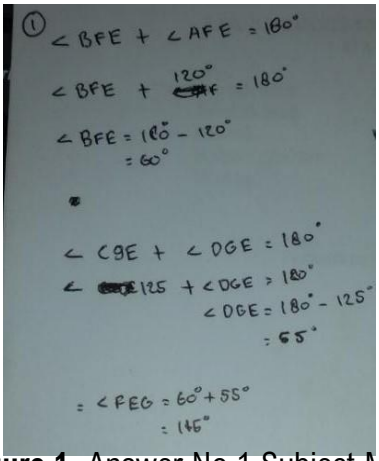


**Figure 1.** Answer No.1 Subject MH

Based on Figure 1, it can be obtained that MH students can do P1 because they write the known and unknown angle symbols. Then MH has also done step P2 because he has made a plan to solve the problem by finding the BFE angle and the DGE angle first before finding the

angle in question. This activity is also evidenced by the results of the interview with MH regarding how the plan to solve problem number one.

Researcher : *How do you plan to solve problem number one?*
MH : *To solve this problem, I made a plan first by looking for other angles, namely the BFE angle and the DGE angle, then I added up the results of the angle search and found that the FEG angle is 115 degree.*

In addition, MH has also completed according to the P3 planning asked but still has not checked whether the step is appropriate or not. After the researcher corrected the answer to MH's answer, the completion step was appropriate, but there was no answer conclusion statement to recheck the answer. MH also explained this when interviewed:

*Researcher : Why don't you check your answers again?*
*MH : I forgot to check the answer again because I immediately worked on the next question, I think without checking again the answer would have been correct*

So, based on Figure 1 done by MH. the score obtained is 4, meaning that the research subject only reached the P3 indicator (solving the problem according to the plan) without checking the answer again.

***MH students' achievement on Higher Order Thinking Skills (HOTS) questions on line and angle materials***

Evaluate

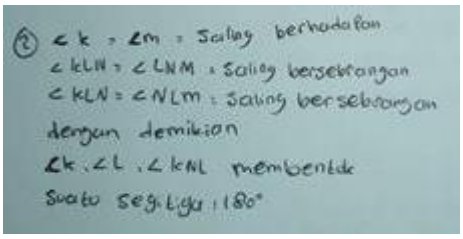


**Figure 2.** Answer No.2 Subject MH

Based on Figure 2. it can be obtained that MH can do P1 because it writes the known and unknown angle symbols. Then MH did step P2 because he had arranged the statement of the position of the angles with each other to prove whether the K angle, the L angle and the KNL angle were 180 degrees. This activity is also evidenced by the results of the interview with MH regarding how to plan to solve problem number two:

*Researcher : How do you plan to solve problem number two?*
*MH : The first step is to find the relationships between angles and then combine the relationships.*

In addition, MH has solved the problem according to the P3 planning asked but not perfect, there are still statements that are not included that support the answer. In addition, MH also has not checked again whether the step is appropriate or not. So, based on Figure 2 that MH did, the score obtained was 3, meaning that the research subject only reached the P3 indicator (solving the problem according to the plan) but it was still not perfect and also had not carried out the process of checking the answer again.

***MH students' achievement on Higher Order Thinking Skills (HOTS) questions on line and angle materials***

Create

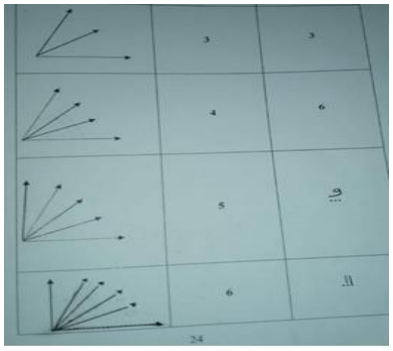

**Figure 3.** Answer No.3 Subject MH

Based on Figure 3. it can be obtained that MH does not solve mathematical problems well. MH wrote the answer based on what was calculated manually without creating new steps or ideas to solve the problem. This activity is also evidenced by the results of the interview with MH regarding how the first step is to solve problem number three:

*Researcher : How do you plan to solve problem number three?*
*MH : When I see a problem like this, I immediately look for the angle manually because I am confused about what formula to use.*

So, based on Figure 3. and the results of the interview conducted by MH, the score obtained was 1, meaning that the research subject only achieved understanding the mathematical problem without planning and checking whether the answer was correct.

***ZA students' achievement on Higher Order Thinking Skills (HOTS) questions on line and angle material***

Analyze

Subject ZA represents the medium category in solving mathematical problem solving questions on *High Order Thinking Skills* (HOTS). The following is an analysis of ZA's work:

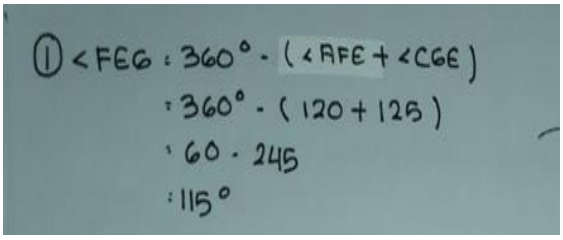


**Figure 4.** Answer No.1 Subject ZA

Based on Figure 4, it can be seen that the subject can do P1 because he wrote down other unknown information in the question. Then ZA has carried out step P2 because he has prepared a plan by adding the AFE angle and the CGE angle to solve the problem. The answer to this activity is also proven by the results of the interview with ZA regarding how do you plan to solve problem number one?:

*Researcher : How do you plan to solve problem number one?*

*ZA : I find angle AFE and angle CGE first, because angle FEG is the Central angle. So 360 degrees is subtracted from the sum.*

In addition, ZA has not been good at solving according to the P3 planning asked and there is no process of checking back shown by the absence of conclusions at the end of the answer whether the step is appropriate or not. This was also explained by ZA when interviewed:

*Researcher : Are you not used to summarizing your answers?*
*ZA : I'm used to not concluding at the end of the answer so I only reach the result.*

So, based on Figure 4. that ZA did, the score obtained was 2, meaning that the research subject only reached indicator P2 (planning) even though the process of solving was not appropriate and without checking the answer again.

***Student ZA's achievement on Higher Order Thinking Skills (HOTS) questions on line and angle materials***

Create

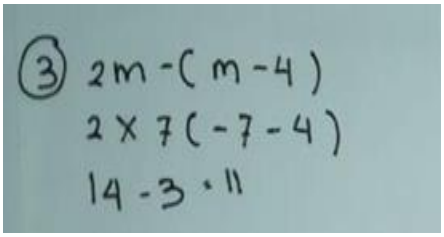


**Figure 5.** Answer No.3 Subject ZA

Based on Figure 5. it can be obtained that ZA can do P1 because it writes other information through patterns made by ZA that are unknown in the problem. Then ZA has done step P2 because he has made a plan by arranging a possible pattern to solve the problem. The answer is also evidenced by the results of the interview with ZA regarding how to plan to solve problem number three:

*Researcher : How do you plan to solve problem number three?*
*ZA : I tried with the pattern ma'am, did I find it. It turns out that from the previous statements, the pattern is also inconsistent. I think there are certain patterns. I'm still confused.*

In addition, ZA has not been good at solving according to the P3 planning asked and there is no process of checking back shown by the absence of conclusions at the end of the answer whether the steps are appropriate or not. So, based on Figure 4. that ZA did, the score obtained was 1, meaning that the research subject only reached indicator P1 (understanding the problem) even though the process of solving was not appropriate and without checking the answer again.

***Achievement of EO Students on Higher Order Thinking Skills (HOTS) questions on lines and angles***

Analyze

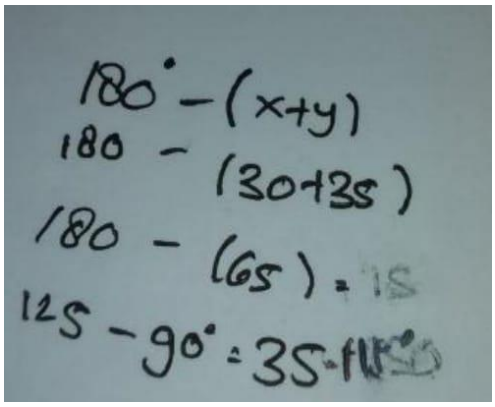


**Figure 6.** Answer No.1 Subject EO

Based on Figure 6. it can be obtained that EO can do P1 because it writes the information memorization symbol $x$ *dan* $y$ from the unknown problem. After the researcher corrected the answer to EO, it turned out that it could develop a solution plan but the plan made was not coherent or shorter without writing the angle symbol or other known information from the problem. Because EO did not write down the symbol information and the solution process was not coherent and there was no re-examination process. This was also explained byEO when interviewed about how the first step in solving problem number one:

Researcher : *How do you plan to solve problem number one?*
EO : *I am not used to working on this problem, the first step is to try to generalize then add the two angles*

*So, activities P2, P3 and P4 were not done well by EOP subjects. So, based on Figure 6 done by EO, the score obtained is 2, meaning that the research subject only reached the P2 indicator (developing a plan) even though it was not in accordance with the answer guidelines without solving the problem according to the plan until re-examining the answer.*

***Student EO's achievement on Higher Order Thinking Skills (HOTS) questions on line and angle materials***

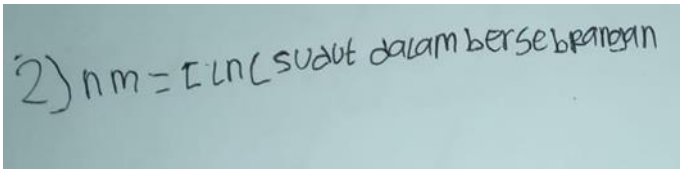


**Figure 7.** Answer No.2 EO Subject

Based on Figure 7. it can be obtained that EO can do P1 because it writes information memorization but cannot plan the problem. Because EO did not write symbol information and the solution process was not coherent and there was no re-examination process. This was also explained by EO when interviewed about how the first step in solving problem number two:

*Researcher : How do you plan to solve problem number two?*

*EO* *: I just encountered a problem like this mom, so the first thing I did was look for the relationship between angles but I was also confused about how to combine them*

So, activities P2, P3 and P4 were not done well by MRAP subjects. So, based on Figure 4.8 done by MRAP, the score obtained is 1, meaning that the research subject only reached indicator P1 (understanding the problem) even without solving the problem according to the plan until re-examining the answer.

***Achievement of EO Students on Higher Order Thinking Skills (HOTS) questions on lines and angles***

***Create***

It was found that EO could perform P1 by knowing the previous information and then applying it to the next question even though the answer was still incorrect. Because EO did not have a plan making process through existing patterns and the mathematical problem solving was not explained. This was also explained by EO when interviewed about how the first step in solving problem number three:

*Researcher* *: What is the initial plan to solve problem number three?*
*EO* *: I didn't understand the question, I calculated the angle with the known line manually. I couldn't find a pattern.*

Based on the results of research and analysis by researchers on students' mathematical problem solving test questions, the *Higher Order Thinking Skills* (HOTS) question category is written in Table 3 below:

**Table 3.** Results of Mathematical Problem Solving Analysis

| Subject Research | Mathematical Problem Solving Indicators | | | | | | | | Average score |
|---|---|---|---|---|---|---|---|---|---|
| | Understanding the Problem | | Develop a Resolution Plan | | Solve problems according to plan | | Check again | | |
| | Score | Info | Score | info | Score | info | Score | Info | |
| MH | 2 | Good | 3 | Good | 4 | Good | 0 | | 2,25 |
| ZA | 2 | Good | 3 | Good | 4 | Good | 0 | | 2,25 |
| EO | 2 | Enough | 3 | Enough | 0 | | 0 | | 1,25 |

Based on Table 3, the researcher concluded that the final result was that students in the high category were able to go through mathematical problem solving to the stage of solving the problem according to plan. Medium category students can go through mathematical problem solving to the stage of planning. Low category students can go through mathematical problem solving to the stage of understanding the problem.

## Discussion

The assessment of students' mathematical problem-solving proficiency in relation to the Lines and Angles material at MTs Ar-Raudhatul Hasanah Medan offers valuable insights into their cognitive abilities and understanding of mathematical concepts. The inclusion of Higher Order Thinking Skills (HOTS) questions is of utmost importance as it necessitates students to go beyond mere memorization and apply critical thinking and problem-solving strategies. Initially, the HOTS questions evaluate students' grasp of geometric concepts, specifically lines and angles. These questions typically present complex problem scenarios that challenge

students to exhibit a profound comprehension of the interrelationships among various geometric elements. The analysis aids in determining how effectively students can transfer their theoretical knowledge to practical problem-solving situations. Additionally, the capacity to reason and think logically plays a pivotal role in solving HOTS questions. By scrutinizing the responses, valuable information can be obtained regarding students' ability to employ deductive reasoning and logical steps to arrive at a solution. This understanding is crucial for educators as it enables them to tailor instructional approaches that enhance students' logical thinking skills, which are not only essential in mathematics but also in various facets of their academic and professional lives.

Moreover, the examination brings to light potential misunderstandings or gaps in students' comprehension of Lines and Angles. The identification of common mistakes or challenging areas can assist teachers in devising targeted interventions to tackle specific obstacles that students may encounter. This evaluative component is crucial for an approach that prioritizes the needs of the students, enabling educators to offer personalized assistance and cultivate a more profound understanding of mathematical concepts. Additionally, the assessment of students' problem-solving capabilities in relation to higher-order thinking skills (HOTS) questions serves as an indicator of the effectiveness of the teaching methodologies employed at MTs Ar-Raudhatul Hasanah Medan. It functions as a feedback mechanism for educators to assess the alignment between instructional methods and the cultivation of higher-order thinking skills. Adjustments can be made in teaching strategies based on the strengths and weaknesses identified during the analysis. In summary, the analysis of students' mathematical problem-solving abilities in relation to HOTS questions pertaining to the Lines and Angles material at MTs Ar-Raudhatul Hasanah Medan is a comprehensive process that yields valuable information for both educators and students. It aids in comprehending the depth of conceptual understanding, logical reasoning skills, and areas that require improvement, thereby contributing to the continuous enhancement of the teaching and learning process in mathematics.

The results obtained in this study are that high category students are able to go through mathematical problem solving up to the stage of solving problems according to plan. Medium category students can go through mathematical problem solving up to the planning stage. Low category students can go through mathematical problem solving up to the stage of understanding the problem. The discussion on the classification of students by ability category in mathematical problem solving provides important insights in understanding students' progress and needs in developing their mathematical skills. High category students, who were able to go through mathematical problem solving to the stage of solving the problem as planned, showed a very strong ability in applying problem solving strategies. They were able to quickly identify the problem, plan an appropriate approach and efficiently solve the problem. These results show that they have a deep understanding of mathematical concepts as well as the ability to apply them well in different contexts. For students in this category, additional challenges and more in-depth learning are needed to maintain and develop their abilities. Medium category students, who can go through mathematical problem solving up to the planning stage, show a fairly good ability to understand and plan an approach to solving problems. They may need additional help or support in implementing their planned strategies, but they have solid basic problem-solving skills. For students in this category, it is necessary to provide additional guidance and practice to help them improve their problem solving skills. Low category students, who can go through mathematical problem solving up to the stage of understanding the problem, show that they have difficulties in applying more complex problem solving strategies. They may understand the problem well, but struggle in planning and executing the approach to solve the problem. For students in this category, more intensive and individualized interventions

are needed to help them develop their problem solving skills from the comprehension stage to the planning and problem solving stages.

The solution to this situation is to provide additional challenges. These students may need more challenging tasks to continue developing their abilities. Teachers can provide extra, more complex problems or projects that demand creativity and higher-level thinking. Using a project-based learning approach can provide opportunities for students to apply their problem-solving skills in a more real-world, in-depth context. These projects can challenge students to solve more complex problems and demand teamwork. Encouraging high category students to participate in mathematical discussions and debates can help them develop a deeper understanding of mathematical concepts. These discussions can also spark new ideas and broaden their views on how to solve problems. The solution for moderate category students is that using visual models and diagrams can assist students in planning an approach to solving the problem. It helps them visualize the problem and plan the steps needed to reach a solution. Providing specific exercises that focus on planning approaches to solving problems can help students develop this skill further. Teachers can provide a series of problems that require students to plan strategies before attempting to solve them. Encouraging students to collaborate with classmates in planning approaches to solving problems can help them broaden their outlook and gain new insights.

Solutions for low category students are providing individual support to these students through counseling or tutoring sessions can help them overcome difficulties in mathematical problem solving, using a differentiated learning approach that allows students to work at a level appropriate to their abilities can help low category students gain confidence and improve their abilities gradually, and focusing on strengthening basic fundamental mathematical concepts can help students in understanding problems better and planning the right approach to solve them. This exposure is in line with the results of research by Nurmilah et al., (2023) which revealed that students' mathematical problem solving abilities are very diverse. Some students may have a strong understanding of basic mathematical concepts, allowing them to quickly identify important information in a problem, apply appropriate formulas or strategies, and find solutions efficiently. On the other hand, there are students who may be more creative in their approach to mathematical problems, perhaps finding solutions in unique ways or using unorthodox methods. In addition, there are students who have strong analytical thinking skills, enabling them to analyze problems in depth, identify patterns or relationships, and make informed decisions in the process of solving them. Self-confidence also plays an important role; confident students tend to be more motivated to try to solve difficult problems. Conversely, students who lack self-confidence may have difficulty in facing mathematical challenges. Other factors that influence mathematical problem solving ability include mathematical communication skills, consistency in practice, and student motivation. By understanding these differences, educators can provide appropriate support to improve each student's mathematical problem solving ability. Furthermore Amaliah et al., (2021) revealed that the results of the analysis and discussion related to students' mathematical problem solving abilities on quadrilateral and triangle material based on Polya's stages, it was concluded that high ability category students were able to solve the problems given, but were less careful in writing the conclusions of the desired solution and were less careful in writing units. Students in the medium ability category have not been able to solve the problems given because they are only able to understand the problem and plan the solution, students have difficulty in carrying out the calculation/computation process and are not careful when working. Students in the low ability category have not been able to solve the problems given because students have difficulty in understanding the problem, so they are unable to carry out the next steps.

## Conclusion

To conclude, the examination of students' aptitude in solving mathematical problems that require *Higher Order Thinking Skills* (HOTS) in relation to lines and angles at MTs Ar-Raudhatul Hasanah Medan offers valuable insights into their cognitive proficiency and application of mathematical concepts. The findings indicate that the students exhibited varying levels of proficiency in tackling intricate problems that necessitated critical thinking and a profound comprehension of the lines and angles material. The utilization of HOTS questions proved to be an efficacious approach in evaluating students' analytical skills and their ability to apply mathematical principles beyond mere memorization. The results highlight both areas of strength and areas that may necessitate additional attention in the teaching and learning process. Furthermore, the analysis underscores the significance of integrating HOTS questions into the curriculum to enhance students' problem-solving abilities and foster a deeper understanding of mathematical concepts. It emphasizes the need for educators to continuously adapt their teaching methods to stimulate critical thinking and cultivate a supportive learning environment. Ultimately, addressing the identified challenges and building upon the strengths revealed through this analysis will contribute to the overall enhancement of students' mathematical problem-solving abilities. It accentuates the importance of an inclusive and dynamic pedagogical approach that empowers students to think critically and apply mathematical concepts in real-world scenarios, thereby ensuring their preparedness for future academic challenges.

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