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Analysis of the Mathematical Reasoning Ability of High School Students in Solving Trigonometric Problems

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Abstract
Reasoning is needed by students to solve trigonometry problems that are considered difficult to solve. So, the researcher conducted a study to determine students' mathematical reasoning skills in solving trigonometric problems. This type of research is descriptive research with qualitative methods. The subjects of this study were 3 students of class XII in one of the senior high schools in North Central Timor district. Data collection techniques were test questions and interviews. From the results of the study, it was concluded that high category mathematical reasoning ability was able to fulfill 4 reasoning indicators, medium category mathematical reasoning ability was able to fulfill 2 reasoning indicators, while low category reasoning ability only fulfilled 1 reasoning ability indicator.

Keywords: Mathematical Skills, Mathematical Reasoning Skills, Trigonometry

1. INTRODUCTION

Mathematics is one of the fields of education that is very important to learn because almost all aspects of life in various other fields of science are related to mathematics. Learning mathematics from an early age in a structured manner is the first step for students to understand mathematical concepts. In the development of concept mastery, reasoning is very important for students to provide meaning in the independent learning process (Yusdiana & Hidayat, 2018a). Mathematics learning and reasoning are two things that are interrelated. Mathematics learning can be understood through good reasoning and reasoning skills can be trained and understood through learning mathematics (Aprisal & Arifin, 2020).

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Reasoning is a series of activities that have the capacity to apply logic consciously to draw a conclusion from one or more new or pre-existing information using various patterns that aim to find the truth (Siahaan & Simamora, 2024). In other words, mathematical reasoning is thinking about mathematical problems logically to obtain solutions by connecting new knowledge with existing knowledge (Wardhani, 2008). Reasoning ability is important for students in everyday life. An example of the importance of mathematical reasoning for students is in solving Trigonometry problems.

Trigonometry is a branch of mathematics that studies the relationship between the sides and angles of a triangle. The relationship between sides and angles is expressed in terms of sine, cosine, and tangent ratios (Arnila et al., 2023). By applying reasoning skills, students are expected to solve Trigonometry problems using sequential or systematic solution patterns. One of the important standards in the mathematical literacy process is reasoning (Ramdan & Roesdiana, 2022).

Efforts to improve mathematical reasoning skills can not only help students in solving everyday problems, but also students are able to apply mathematics to other fields of science so as to reduce the symptoms of low reasoning skills. One of the goals of learning mathematics at school is reasoning ability that can train thinking and reasoning in drawing conclusions, developing problem solving and the ability to explain ideas (Sumartini, 2015).

Trigonometric comparison material is also quite difficult material to learn because there are many formulas that must be mastered. According to Nurmeidina et al.'s opinion, students find it difficult to determine the formula to be used in the problem being worked on (Nurmeidina & Djamilah, 2019). The use of trigonometric formulas in everyday life that are still absurd or still very rare causes students to find it difficult(Wigati, 2016). Therefore, it is very important for teachers to pay more attention to teaching Trigonometry material in the classroom.

Based on the author's experience in teaching trigonometry, students often face difficulties in connecting trigonometric concepts with the problems presented. They also struggle to memorize all the trigonometric formulas, resulting in low learning outcomes in trigonometry. Furthermore, according to interviews with mathematics teachers, students are more accustomed to routine problems that directly apply formulas without engaging in reasoning processes or problem-solving tasks.

By improving mathematical reasoning skills, students are expected to be able to think logically, systematically, and critically in solving trigonometric problems in the form of special angles. Reasoning ability is needed by students not only limited to the scope of school but also in everyday life (Rohmah, Septian, & Inayah, 2020). The reasoning ability indicators used in this study are the reasoning index according to (Sinatrya, 2021). The reasoning indicators tested include finding patterns or properties of mathematical phenomena, making generalizations, making conjectures, performing mathematical manipulations, and drawing conclusions, as well as providing reasons or evidence for the correctness of the solution.

Trigonometry is a fundamental topic essential for various advanced fields of mathematics and science. Therefore, analyzing students' reasoning abilities in trigonometry is crucial by assessing their skills based on the achievement of reasoning ability indicators. The purpose of this study is to determine the mathematical reasoning ability possessed by high school students in solving trigonometric problems.

2. METHODS

Type of research

This research uses a qualitative descriptive method that aims to describe students' mathematical reasoning abilities in solving problems related to Trigonometry. Researchers use descriptive research because the data to be processed is qualitative data obtained from analyzing the answers to test questions and the results of interviews on these answers. According to the researcher, a qualitative descriptive approach is appropriate to obtain information based on the results of data collection in the form of written and oral data (Sinatrya, 2021).

Research Participant

This research was conducted in one of the senior high schools in the North Central Timor district. The research was conducted on October 5th of the 2023/2024 school year. The subjects in this study consisted of 3 students from grade XII. The subjects were selected based on test results and recommendations from subject teachers. The selected subjects were students with high, medium, and low mathematical abilities. Furthermore, the researchers will conduct interviews with the selected subjects to explore more deeply their reasoning abilities in solving trigonometric problems.

Data collection techniques

To obtain data in the study, the researcher established the following data collection techniques:

1. Test

In the opinion of Arikunto (2006), a written test is a useful tool for measuring the abilities possessed by the subject. Or it can be interpreted that the written test is carried out with the aim of making it easier to analyze and assess the abilities possessed by the subject. And it can be known the differences in abilities possessed by each research subject.

The lattice of test questions is adjusted to the indicators of mathematical reasoning ability. The number of test questions in the form of descriptions is three questions that contain indicators of mathematical reasoning ability. The test data will be checked and then given a score based on the score obtained. The assessment criteria used were adapted from the assessment criteria developed by Sulistiawati (2014) ensuring that the validity and reliability of these instruments had been tested beforehand. The following are the criteria for assessing test data:

Table 1. Assessment Criteria for Mathematical Reasoning Ability Indicators

No	Indicator	Score	Criterion
1	Finding patterns of mathematical symptoms	4	Correct answer with the right work steps
		3	The answer is correct but has one error in the work step.
		2	Partial correct answers with two or more errors
		1	The answer is incomplete and contains only one correct substitution.
		0	Incorrect answers and processes
2	Filing allegations	4	Correct answer with the right work steps
		3	The answer is correct but has one error in the work step.
		2	Partial correct answers with two or more errors

		1	The answer is incomplete and contains only one correct substitution.
		0	Incorrect answers and processes
3	Performing manipulations	4	Correct answer with the right work steps
		3	The answer is correct but has one error in the work step.
		2	Partial correct answers with two or more errors
		1	The answer is incomplete and contains only one correct substitution.
		0	Incorrect answers and processes
4	Drawing conclusions	4	Correct answer with the right work steps
		3	The answer is correct but has one error in the work step.
		2	Partial correct answers with two or more errors
		1	The answer is incomplete and contains only one correct substitution.
		0	Incorrect answers and processes

2. Interview

An interview is a direct conversation conducted by an interviewer to a resource person to obtain information (Arikunto 2006). The author concludes that an interview is an activity that occurs between two parties, namely the interviewer and the source (as a source) to obtain valid information about a problem. The form of interview used is semi-structured so that the subject is freer when conveying the information needed by the researcher but still in the context of the conversation. Interviews were conducted with subjects who had been selected based on the scores of the written test results. Taking subjects for interviews is based on consideration of several things (Lestari et al., 2022).

3. RESULTS AND DISCUSSION

Based on the results of the written test given to 22 students, data on the achievement of reasoning ability indicators from answer analysis based on scoring guidelines were obtained as follows.

Table 2. Achievement of Reasoning Ability Indicators

Reasoning indicators	Question number	jumlah	percentage	Rata-rata
Finding patterns of mathematical symptoms	1	9	40,9%	37,87%
	2	8	36,36%	
	3	8	36,36%	
Filing allegations	1	11	55%	29,07%
	2	1	4,5%	
	3	5	27,72%	
	1	2	9,09%	

Perform mathematical manipulation	2	1	4,5%	10,59%
	3	4	18,18%	
	1	1	4,5%	
Drawing conclusions	2	1	4,5%	4,5%
	3	1	4,5%	

From the results of written tests and interviews that have been conducted on 3 research subjects of class XII Science 2, the researcher found data on different reasoning abilities as follows:

1. Subjects with high mathematical abilities

The test and interview results for subjects with high mathematical ability in problem number 1 the subject is able to use reasoning power in solving the problem. Based on the test answers and interviews, the subject is able to find patterns from mathematical phenomena, namely writing what is known and asked. Then, the subject proposes an initial conjecture to solve the problem in the form of a formula that can be used to calculate the smallest angle formed on the clockwork. Furthermore, the subject is able to perform mathematical manipulations by entering the right numbers to perform calculations. The interview excerpt between the researcher (R) and the high ability subject (HS) is as follows:

R : *Okay, now try to explain how to calculate the smallest angle using your own reasoning.*

HS : *I used the formula for the difference between the angle of the minute hand and the angle of the hour hand, ma'am. The long method involves finding the angle of the minute hand first, then finding the angle of the hour hand, and finally subtracting. The short method is* $\frac{11}{2} \times b - 30^0 \times a$*, so I just used that, ma'am. 'b' is for the number pointed to by the hour hand, while 'a' is for the number pointed to by the minute hand.*

R : *Why did you use the number 5 for the hour hand instead of 17?*

HS : *Because, ma'am, in the question, it's 17:14. On the clock, the hour hand points to the number 5. In the formula, the number pointed to by the hour hand means the number 5, not 17.*

R : *Provide your conclusion for question 1.*

HS : *So, the smallest angle of the clock hands at 17:14 WITA is* 73^0.

At the end of the answer, the subject gave the conclusion of the answer obtained. This proves that subjects with high mathematical ability are able to fulfill 4 indicators of reasoning ability. In accordance with the opinion of (Inayah, 2024), subjects with high mathematical ability are able to perform mathematical reasoning.

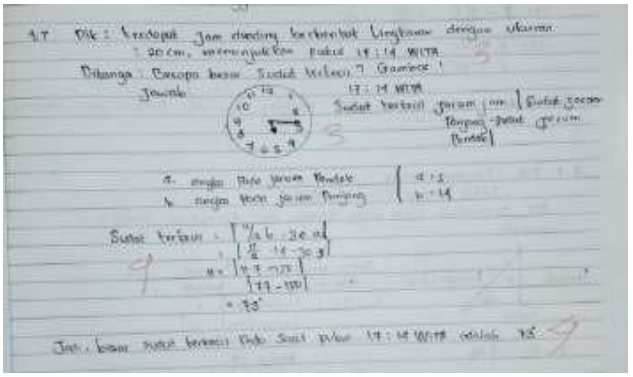

Figure 1. Test Results Number 1 Subjects with High Mathematical Ability

In problem number 2, HS (High Subject) was able to identify questions in the form of pictures and writing. The subject can also propose the conjecture of solving the problem correctly so that the subject is able to perform mathematical manipulation based on the initial conjecture. In the last step, the subject provides a conclusion from the answer that has been done. From this, it can be said that the subject fulfills 4 of the reasoning ability indicators (Lestari et al., 2022).

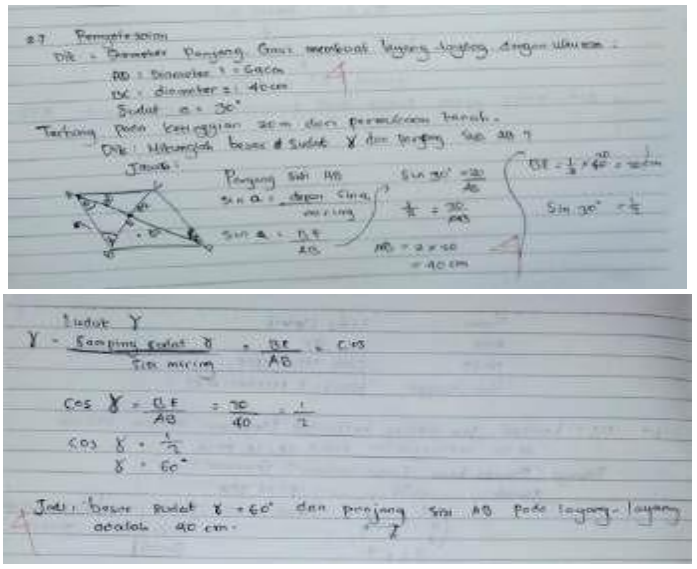

Figure 2. Test Results Number 2 Subjects with High Mathematical Ability

Problem number 3, HS was able to identify the problem, then provide a picture illustration based on the existing problem. The subject was also able to make initial conjectures and then perform mathematical manipulations briefly and precisely. In the last step, the subject made a conclusion.

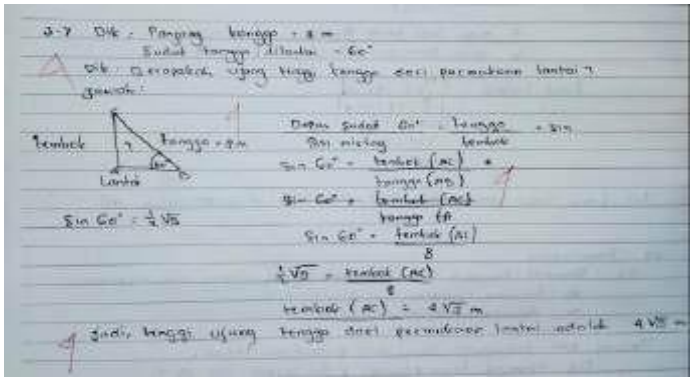

Figure 3. Test Results Number 3 Subject with High Mathematical Ability

From the discussion above, subjects with high mathematical ability were able to perform mathematical reasoning. The subject met the 4 indicators of reasoning ability tested. This is in accordance with Akuba et al. (2020) opinion that mathematical reasoning ability is when someone is able to link the assumptions of a mathematical phenomenon to get the initial guess of the solution process to make a logical conclusion.

2. Subjects with moderate mathematical ability

Furthermore, the results of tests and interviews of subjects with moderate mathematics abilities in problem number 1 the subject is able to identify problems, namely writing what is known and asked. The subject can also make conjectures and mathematical manipulations. Thus, the subject fulfills 3 indicators of reasoning ability, namely finding patterns from mathematical symptoms, making conjectures and performing mathematical manipulations The results of this study are in line with research findings by (Ardhiyanti et al., 2019) that state students with moderate mathematical abilities can fulfill three indicators. The interview excerpt between the researcher and the moderate ability subject is as follows:

R	:	*Based on the question, try to describe what is known and what is being asked.*
MS	:	*From the question, it is known that in classroom A, there is a wall clock with a size of 20 cm indicating the time 17:14 WITA. What is being asked is the clock drawing and the measure of the smallest angle.*
R	:	*For question 1, you were asked to draw the clock based on the given information and in a Cartesian plane. Why did you only draw the clock without including the Cartesian plane?*
MS	:	*I forgot, ma'am. I drew it in a rush. I thought it was okay.*
R	:	*Can you explain the calculation steps you made?*
MS	:	*I used the formula* $\frac{11}{2} \times b - 30^0 \times a$*, ma'am. Then I substituted the numbers, so it became* $\frac{11}{2} \times 14 - 30^0 \times 5$.
R	:	*Why did you use the number 5 in your calculation instead of 17?*
MS	:	*The number 5 is because aaa refers to the number pointed to by the hour hand, ma'am.*
R	:	*Okay. Now, can you summarize the answer to question 1?*
MS	:	*Sure, ma'am. The conclusion is that the smallest angle in the question is 75º*

Orally the subject fulfills the reasoning indicator of drawing conclusions. In line with the opinion Lestari et al. (2022), the indicator of drawing conclusions is often not given by students at the end of the answer due to various factors.

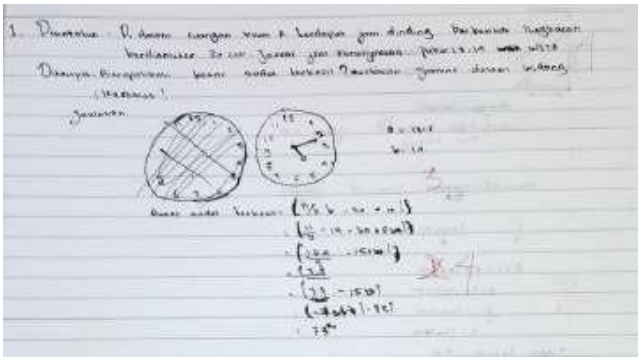

Figure 4. Test Results Number 1 Subject with Moderate Mathematical Ability

In problem number 2, MS (Moderate Subject) identified the problem first but did not make an initial guess to solve the problem. From the results of the interview, it is also known that the subject is still confused about the concept of a kite flat in the problem. Misunderstandings in conceptual understanding often occur among students with moderate reasoning abilities (Ardhiyanti et al., 2019; Raharjo et al., 2020). In line with (Lesmana & Effendi, 2020; Raharjo et al., 2020) opinion the subject cannot explain well the things contained in the problem so that the problem solving is not fulfilled. For

problem number 2, the subject only fulfills 1 indicator of mathematical reasoning ability, namely finding patterns from mathematical symptoms.

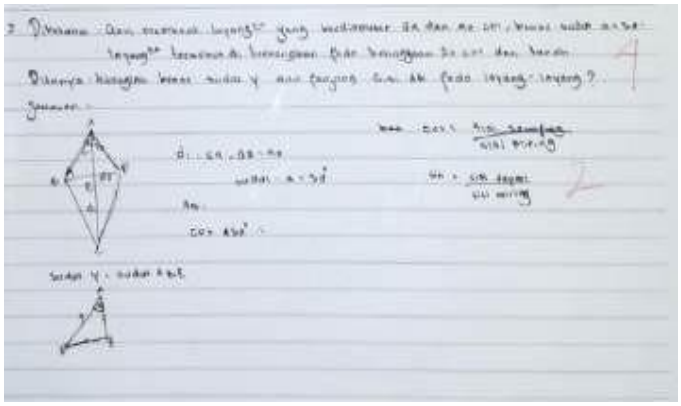

Figure 5. Test Results Number 2 Subject with Moderate Mathematical Ability

For problem number 3, students with moderate mathematical ability are able to find patterns that can be seen from the subject being able to identify problems. Then the subject is able to make initial guesses by providing image illustrations. Based on the picture the subject makes a solution process that can be used to solve the problem. At the manipulation stage the subject made a mistake, namely incorrectly entering the value of sin 60°, thus affecting the final result of the subject's answer. The subject also did not conclude the final result of his answer. Judging from the steps of the process, moderate ability students are only able to fulfill 2 reasoning indicators correctly, namely finding patterns and making initial guesses. In the indicator of performing mathematical manipulation, the subject was able to manipulate but the numbers the subject entered were wrong so that it affected the final answer. The results of this study are in line with research conducted by Yusdiana & Hidayat (2018b), which states that students with moderate abilities are also capable of planning problem-solving and solving problems accurately. However, the students did not perform the re-evaluation stage.

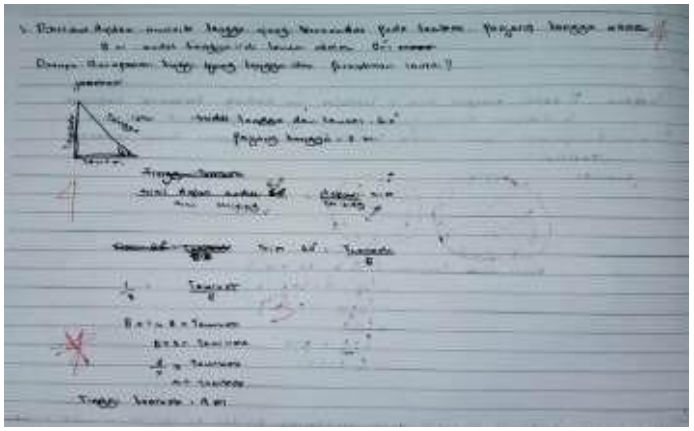

Figure 6. Test Results Number 3 Subject with Moderate Mathematical Ability

3. Subjects with low mathematical ability

Subjects with low mathematical ability in problem number 1 did not write what was known and asked in the problem, but verbally through interviews the subject was able to explain well. The subject did not solve the problem according to the usual solution steps. In the written answer, the subject made drawings and calculations with formulas but was unable to explain what was written verbally. The results of test

number 1 from low ability students did not meet the 4 indicators of mathematical reasoning ability.

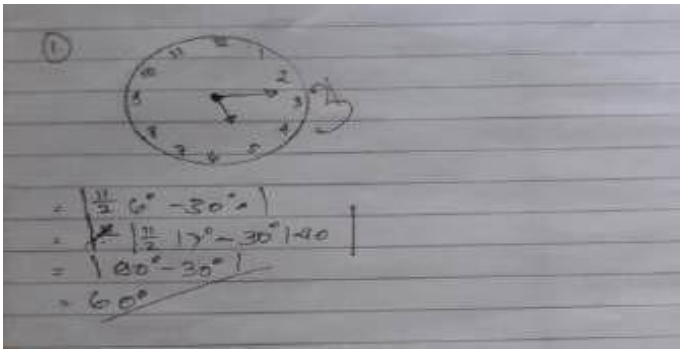

Figure 7. Test Results Number 1 Subject with Low Mathematical Ability

The answers of low ability students in problem number 2, the subject incorrectly identified the problem, both known and asked. Based on the results of the interview, the subject still does not understand the concept of a kite. In the solution, the subject did the calculation with the ton formula but could not explain the reason why the ton angle was calculated with 30°. The interview excerpt between the researcher and the low ability subject is as follows:

R : Try to explain what you understand from the question or describe what is known from the problem.
LS : Yes, ma'am, in the problem, it is known that the ladder is 8 cm long, and the angle is 60^0.
R : Then, what is being asked in the question?
LS : The height of the ladder's top end from the floor, ma'am.
R : Do you understand the meaning of the question? Can you explain the diagram in your answer?
LS : I'm still a bit confused, ma'am.
R : If you don't fully understand, how did you conclude this answer using the calculations for sine and tangent?
LS : I looked at the front side of the 60^0 angle, ma'am. Because in the formula, it's the opposite side divided by the hypotenuse, so I wrote $\frac{8}{AC}$ to find the sine.
R : Then what about tangent?
LS : Tangent is used to find the length of BC, ma'am, so the opposite side, which is 8 cm, divided by BC.

For the results of test number 2, subjects with low mathematical ability did not fulfill the indicators of question number 2 and 4 indicators of reasoning both in writing and orally.

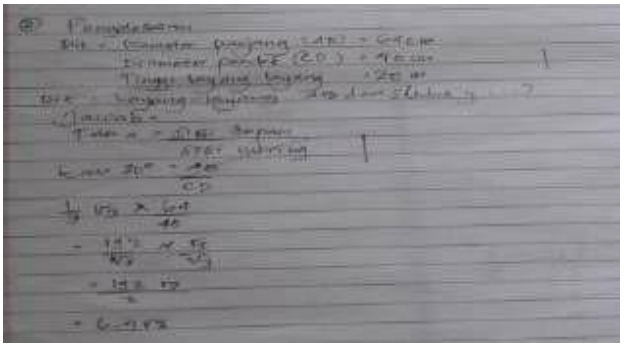

Figure 8. Test Results Number 2 Subject with Low Mathematical Ability

The results of test number 3 from the subject with low mathematics ability, the subject identified the problem by making a picture illustration first then writing what was known and asked based on the picture. The subject made a mistake in placing the size on the illustration of the picture, thus making the subject wrong in writing what is known and asked. The problem-solving conjecture that the subject used, sin, was almost correct, but the error in identifying the problem made the subject do the wrong calculation.

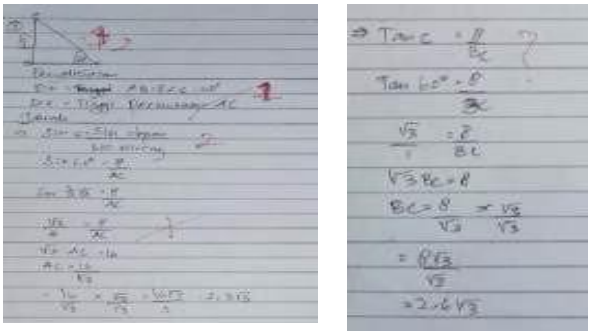

Figure 9. Test Results Number 3 Subject with Low Mathematical Ability

Below is a summary table of the results of interviews with research subjects.

Table 3. Interview Results

No	Ability Level	Question 1				Question 2				Question 3			
		1	2	3	4	1	2	3	4	1	2	3	4
1	High	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Moderate	✓	✓	✓	✓	✓	X	X	X	✓	✓	X	X
3	Low	✓	X	X	X	X	X	X	X	✓	✓	X	X

Information:

✓ : Subject is able to reason verbally during the interview X: Subject is unable to reason verbally during the interview

From the table, it can be seen that in questions 1, 2, and 3 seen through interviews, subjects with high ability are able to reason or think logically and are able to communicate well. While subjects with moderate mathematical ability is only able to reason on indicators of finding patterns and making conjectures. For indicators of manipulating and drawing conclusions, the subject has not been able to give an opinion correctly. Subjects with low mathematical ability are only able to find patterns from mathematical phenomena but the subject is not able to make conjectures, manipulate or draw conclusions. Thus, it can be said that the subject's ability to reason and convey his thoughts directly is still relatively low.

In accordance with Linola et al. (2017), opinion that students' abilities affect their reasoning abilities. Students with high mathematical ability are able to reason very well, in contrast to students with medium and low mathematical ability. Students with moderate mathematical ability are only able to reason a little well. And poor reasoning often occurs in students with low math ability.

4. CONCLUSION

From the results of the discussion that has been done, the researcher concludes that students with high mathematical ability are able to fulfill 4 reasoning indicators, students with moderate mathematical ability are able to fulfill 2 reasoning indicators, while students with low mathematical ability are only able to fulfill 1 reasoning indicator.

The researcher suggests that teachers, lecturers, and other researchers develop indicators for reasoning ability instruments to clearly identify the problems students face in solving reasoning questions. Additionally, providing at least five reasoning questions is recommended so that the description of reasoning ability approaches saturation.

REFERENCES

Akuba, S. F., Purnamasari, D., & Firdaus, R. (2020). Pengaruh Kemampuan Penalaran, Efikasi Diri dan Kemampuan Memecahkan Masalah Terhadap Penguasaan Konsep Matematika. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *4*(1), 44. https://doi.org/10.33603/jnpm.v4i1.2827.

Aprisal, A., & Arifin, S. (2020). Kemampuan Penalaran Matematika Dan Self-Efficacy Siswa Smp. *Delta: Jurnal Ilmiah Pendidikan Matematika*, *8*(1), 33. https://doi.org/10.31941/delta.v8i1.945.

Ardhiyanti, E., Sutriyono, S., & Pratama, F. W. (2019). Deskripsi Kemampuan Penalaran Siswa Dalam Pemecahan Masalah Matematika Pada Materi Aritmatika Sosial. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *3*(1). https://doi.org/10.31004/cendekia.v3i1.82.

Arikunto S. (2006). Prosedur penelitian suatu pendekatan praktik. In *Jakarta: Rineka Cipta*.

Arnila, B., Khotimah, H., & Lipiantanna, S. (2023). Problem Based Learning (PBL) dalam Pembelajaran Trigonometri. *Kompetensi*, *16*(2), 485–491. https://doi.org/10.36277/kompetensi.v16i2.186.

Inayah, H. ; S. T. M. (2024). Analisis Proses Berpikir Siswa Pada Materi Persamaan Kuadrat Berdasarkan Kemampuan Penalaran Matematis. *Advance In Social Humanities Research*, *2*(1), 50–62. https://doi.org/https://doi.org/10.46799/adv.v2i1.165.

Lesmana, W. N., & Effendi, K. N. S. (2020). Analisis kemampuan penalaran matematis siswa SMP pada materi himpunan. *Jurnal Didactical Mathematics*, *4*(1), 119–126.

Lestari, M., Subanji, S., & Irawati, S. (2022). Analisis Kemampuan Analisis Kemampuan Penalaran Matematis Siswa Sma Pada Materi Matriks. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(1), 550. https://doi.org/10.24127/ajpm.v11i1.4577.

Linola, D. M., Marsitin, R., & Wulandari, T. C. (2017). Analisis Kemampuan Penalaran Matematis Peserta Didik Dalam Menyelesaikan Soal Cerita di SMAN 6 Malang. *Mathematics Education*, *1*(1), 27–33. http://ejournal.unikama.ac.id/index.php/pmej.

Nurmeidina, R., & Djamilah, S. (2019). Pelatihan Tips dan Trik Trigonometri Mudah Untuk Siswa SMA. *Jurnal Pendidikan Dan Pengabdian Masyarakat*, *2*.

Raharjo, S., Saleh, H., & Sawitri, D. (2020). Analisis Kemampuan Penalaran Matematis Siswa Dengan Pendekatan Open–Ended Dalam Pembelajaran Matematika. *Paedagoria: Jurnal Kajian, Penelitian Dan Pengembangan Kependidikan*, *11*(1).

Ramdan, M. G. A. R., & Roesdiana, L. (2022). Analisis Kemampuan Penalaran Matematis Siswa SMP Pada Materi Teorema Phytagoras. *Jurnal Educatio FKIP UNMA*, *8*(1). https://doi.org/10.31949/educatio.v8i1.1996.

Siahaan, T. M., & Simamora, R. (2024). *Pengaruh Model Problem Based Learning Terhadap Kemampuan Penalaran Matematis Mahasiswa Universitas HKBP Nommensen Pematangsiantar*. *8*(1), 65–69.

Sinatrya, P. (2021). *Analisis Kemampuan Penalaran Matematis Siswa Dalam Menyelesaikan Soal Open-Ended Pada Pokok Bahasan Perbandingantrigonometri Kelas X Teknik Manajemen Dan Perawatan Otomotif Di Smk Negeri 2 Depok Tahun Ajaran 2020/2021*.

Sulistiawati. (2014). Analisis Kesulitan Belajar Kemampuan Penalaran Matematis Siswa Smp Pada

Materi Luas Permukaan Dan Volume Limas. *Proceeding Seminar Nasional Pendidikan Matematika, Sains, Dan Tik Stkip Surya 2014*, *78 – 602 – 14432 – 2 – 4*.

Sumartini, T. S. (2015). Peningkatan Kemampuan Penalaran Matematis. *Pendidikan Matematika*.

Wardhani, S. (2008). Analisis SI dan SKL mata pelajaran matematika SMP/MTs untuk optimalisasi tujuan mata pelajaran matematika. *Yogyakarta: PPPPTK*.

Wigati, S. (2016). Meningkatkan Hasil Belajar Matematika Pokok Bahasan Trigonometri Melalui Model Pembelajaran Berbasis Masalah Di Kelas X-7 Semester 2 Sma 15 Semarang Tahun Pelajaran 2015 / 2016. *Jkpm*, *3*(September).

Yusdiana, B. I., & Hidayat, W. (2018a). Analisis Kemampuan Penalaran Matematis Siswa SMA pada Materi Limit Fungsi. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *1*(3), 409. https://doi.org/10.22460/jpmi.v1i3.p409-414.

Yusdiana, B. I., & Hidayat, W. (2018b). Analisis Kemampuan Penalaran Matematis Siswa SMA Pada Materi Limit Fungsi. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *1*(3). https://doi.org/10.22460/jpmi.v1i3.p409-414.