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Analysis of Mathematical Reasoning Ability in Trigonometry Materials Viewed from Students' Mathematical Resilience

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Abstrak

Penelitian ini menganalisis kemampuan penalaran matematis pada materi trigonometri terkait resiliensi siswa. Partisipan dalam penelitian ini adalah tiga siswa kelas X SMA. Metode yang digunakan dalam penelitian ini adalah deskriptif-kualitatif. Teknik yang digunakan dalam memvalidasi data adalah teknik triangulasi. Hasil penelitian menunjukkan bahwa indikator kemampuan penalaran yang paling tinggi adalah indikator melakukan perhitungan. Terlihat dari hasil jawaban bahwa subjek rata-rata mampu menghitung dengan benar sesuai dengan konsep yang digunakan, sedangkan indikator terendah adalah indikator membuat prediksi dan kesimpulan yang hanya sedikit yang mampu membuat model, mengilustrasikan , dan sederhanakan setiap soal yang diberikan. Hubungan antara kemampuan penalaran matematis dan resiliensi terlihat dari berbicara dan memastikan kesamaan antara jawaban tertulis dan lisan saat melakukan wawancara. Kemudian hasil yang ditemukan peneliti adalah respon dari jawaban S1 mampu dijawab secara lisan dengan tepat dan detail, sedangkan resiliensi untuk S2 dan S3 masih kurang saat menjelaskan hasil jawaban subjek karena sudah ada jawaban. itu tidak benar. Mereka tidak memahami jawaban mereka, mengakibatkan kurangnya rasa percaya diri dan keinginan untuk mencari ilmu dan wawasan. Oleh karena itu, penelitian ini berimplikasi bahwa guru dapat menyesuaikan dengan kemampuan penalaran matematis dan ketahanan siswa dalam menentukan metode pembelajaran.
Kata Kunci: Kemampuan Penalaran Matematis; Trigonometri; Resiliensi.

Abstract

This study analyzes mathematical reasoning abilities in trigonometry material regarding student resilience. The participants in this study were three class X high school students. The method used in this study was descriptive-qualitative. The technique used in validating the data is the triangulation technique. The results showed that the highest indicator of reasoning ability was an indicator of performing calculations. It could be seen from the results of the answers that the subjects, on average, could calculate correctly according to the concepts used, while the lowest indicator was an indicator of making predictions and conclusions in which only a few were able to make models, illustrate, and simplify each of the problems given. The relationship between mathematical reasoning ability and resilience is seen from speaking and ensuring similarities between written and oral answers when conducting interviews. Then the results found by the researcher were that the responses from the S1 answers were able to be answered orally in a precise and detailed manner, while the resilience for S2 and S3 was still lacking when explaining the results of the subject's answers because there were answers that were not quite right. They did not understand their answers, resulting in a lack of self-confidence and will to seek knowledge and insights. Hence, this research implies that teachers can adjust to students' mathematical reasoning abilities and resilience in determining learning methods.
Keywords: Mathematical Reasoning Ability; Trigonometry; Resilience.

I. INTRODUCTION

Mathematical reasoning ability is a form of thinking packaged as a statement to conclude a problem that requires logical ideas to find factual proof (Sofiani, Nurjamil, & Nurhayati, 2023, Khainingsih et al., 2020; Rismen et al., 2020; Saleh et al., 2018). Reasoning ability was first raised in the mathematics curriculum program globally, which has a positive value as a form of effort to reform mathematics learning (Muslimin & Sunardi, 2019; Afriansyah, Permatasari, Hamdani, & Maulani, 2023). The relationship between reasoning abilities and mathematics is a form of unity that is interrelated because, in mathematics material, there is expertise in understanding a problem through reasoning (Muslimin & Sunardi, 2019; Yu & Singh, 2018). The importance of mathematical reasoning ability is that when a person has essential mathematical reasoning ability, that person can develop new things, give opinions, and use mathematical generalizations (Hadiat & Karyati, 2019; Saxton et al., 2019). However, the problem with students' mathematical reasoning abilities is that their ability to reason critically is weak. Students are unfamiliar with problem-solving in critical reasoning adapted to everyday life (Octaviyunas & Ekayanti, 2019; Siregar et al., 2020). In general, trigonometry is learning related to comparative calculations and the value of angles, but the problems that often occur are related to reasoning abilities in trigonometry, namely (1) misunderstood statements on trigonometry problems and carelessness; (2) mistakes in using strategies and formulas; (3) lack of prerequisite knowledge; and (4) misread question s (Bernard et al., 2019; Gradini et al., 2022; Wulandari & Gusteti, 2020; Mujib & Sulistiana, 2023). Then, in the analysis of mathematical reasoning abilities on student characteristics, there is a link between the most important aspects that need to be used by students. The goal is that students can create patterns of thinking that develop and are following their imagination based on their abilities mathematically, namely by connecting their mathematical reasoning abilities to their level of mathematical resilience (Moreno-Armella & Hegedus, 2020; Ramdhani et al., 2020). Mathematical resilience is an attitude in learning mathematics that applies the concept of self-efficacy through perseverance, discussion, reflection, and research, which results in harmony in improving reasoning patterns thinking (Darma et al., 2020).

Problems generally faced when students do not have mathematical resilience are students who do not like learning mathematics because learning mathematics is difficult, complicated, and worrying (Azizah & Abadi, 2022; Cahyani & Sritresna, 2023). Mathematical resilience is essential to overcome inherent anxiety about mathematics or maintain a positive attitude when solving math problems and helping develop new skills as needed (Puspita, Muzdalipah, & Nurhayati, 2023; Azizah & Abadi, 2022; Pennycook & Rand, 2019).

Relevant research related to the material of mathematical reasoning ability, resilience, and trigonometry, namely from Octriana, Putri, and Nurjannah's research on reasoning ability in 2019, stated that

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reasoning and math skills in one junior high school revealed that reasoning abilities were not optimal (Octriana et al., 2019). The difference between the previous research and the research I took was in the subjects, where the researchers took class X high school subjects. This is reflected in the results of student responses, where students emphasize indicators of making conjectures at number 1, and indicators that rarely occur are indicators of drawing logical conclusions because there are visible student errors in operating numbers. Several students fail to conclude problem number 3 (Octriana et al., 2019; Hudiria, Haji, & Zamzaili, 2022). Then research on the reasoning ability of trigonometry material in 2019 is included in the sufficient category because many errors do not include mathematical reasoning indicators when filling out the answer sheet. The reasoning ability research on trigonometry material in 2019 is included in the sufficient category because there are still many mistakes that do not include indicators of mathematical reasoning when looking for trigonometry angle values that are applied in surrounding life when filling out answer sheets, including (1) wrong data errors; (2) procedural errors; (3) missing data errors, and other than seven errors in each of the 4 questions tested (Rahayu, 2019; Husniah & Azka, 2022). The research on mathematical resilience conducted in the 2020 study found that students taught using the Modified Eliciting Activities model had significantly greater mathematical resilience than students who received conventional learning because of students' mathematical flexibility (Rifdah & Cahya, 2020; Ardiansyah, Wahyuningrum, & Rumanta, 2022).

Based on the results of several relevant studies on reasoning ability, trigonometry, and resilience, the gap from previous research is that they focus more on junior high school students' subjects, which discuss the application of the influence of learning models. However, only a few relate it to analysis. Therefore, the renewal of this research is to conduct research through analysis, and the focus of the subject is high school class X students, with the aspect being reviewed being mathematical resilience.

II. METHOD

The research will be conducted using a qualitative approach. This research will be conducted in one of the state senior high schools in East Jakarta for the 2022/2023 school year. Reasoning ability indicators include (1) performing calculations; (2) making forecasts; and (3) drawing conclusions (Yusdiana & Hidayat, 2018). Then how to measure each indicator, namely (1) Perform calculations, namely the subject has expertise in parsing information into its core parts, where students will estimate the process of solving a math problem; (2) making predictions, namely a skill that is centered on skills in understanding the analysis of a problem, which is developed through structural steps towards an actual solution, where students can predict the process of solving a math problem; (3) making conclusions, namely a skill in identifying the development of completing the calculation

process, which has similarities to understanding data and strategies used to strengthen ideas in the form of abstractions, where students are more able to conclude logically.(Yusdiana & Hidayat, 2018)

The instruments in this study were observation instruments, tests, and interviews. In the observation instrument, there are 5 points that we want to find out; in the interview instrument, there are six questions; and in the test instrument, there are three questions. The data collection technique in this study was carried out by giving a trigonometry material description test. The data analysis techniques used in this study were data collection, data reduction, data presentation, and conclusions (Rijali, 2018). Then the researcher has questionnaire data about students' mathematical resilience, where the indicators of students' mathematical resilience are: (1) demonstrating a diligent and confident attitude; (2) having a high sense of curiosity; and (3) having expertise in managing the level of personality (Hendriana et al., 2017). Then, from this data, the student resilience questionnaire data results are sorted from the highest to the lowest using Winsteps, namely (Faradillah & Septiana, 2022).

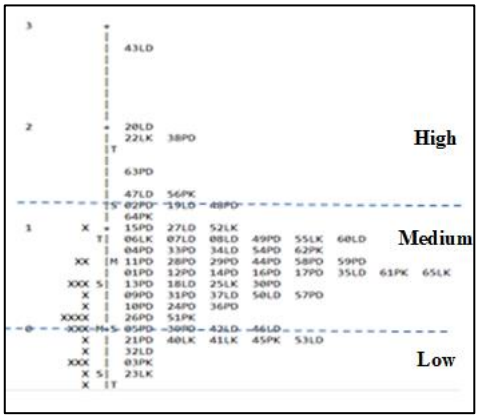

Figure 1. Questionnaire data processing

Based on the above data processing, re-selection was carried out to obtain high, medium, and low levels of resilience categories through data processing using Winsteps, where 60 students became three students. Then, from the three subjects, a reasoning ability test was carried out on trigonometry material, and they were interviewed. The subjects consisted of female and male students (Rahayuningsih & Jayanti, 2019).

The validation instrument in testing the feasibility of the test items was carried out by construct validation, namely lecturers and teachers. After being declared fit for use, the researcher conducted content validity on 120 students. The results of the data test were run using win steps obtained results.

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item
1	432	120	-.10	.23	1.23	1.5	1.20	1.3	.73	.77	54.4	64.7	I1
2	421	120	.49	.23	.75	-1.7	.76	-1.7	.83	.79	67.6	63.4	I2
3	401	111	-.38	.24	1.02	.2	1.02	.2	.75	.74	67.6	63.8	I3
MEAN	418.0	117.0	.00	.23	1.00	.0	.99	-.1			63.2	64.0	
S.D.	12.8	4.2	.36	.00	.20	1.3	.18	1.2			6.2	.5	

Figure 2. Validity of the Question Test

Based on processing the validity data above using winsteps, valid data is obtained because it meets the MNSQ and ZSTD, namely 1.2 and 1.3. This is in line with previous researchers that the data is declared valid if the OUTFIT MNSQ is in the range 0.5 < MNSQ < 1.5, and for the OUTFIT Z-STANDARD (ZSTD) value in the Winsteps application, the criteria are valid if the values obtained meet the range -2 < ZSTD < +2 (Ng et al., 2018; Ramadhani & Fitri, 2020). After the test's validity using winsteps, reliability is carried out, namely.

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	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	10.5	2.9	4.89	1.47				
S.D.	1.6	.3	1.95	.41				
MAX.	12.0	3.0	6.60	1.97				
MIN.	4.0	2.0	-6.19	1.06	.04	-2.0	.04	-2.0

REAL RMSE 1.58 TRUE SD 1.15 SEPARATION .73 Person RELIABILITY .35
MODEL RMSE 1.53 TRUE SD 1.22 SEPARATION .80 Person RELIABILITY .39
S.E. OF Person MEAN = .18

Person RAW SCORE-TO-MEASURE CORRELATION = .78
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .78

Figure 3. Question Test Reliability

After that, from the data processing above, the reliability is stated to be 0.78 because the results exceed the reliability standard of 0.7. This is in line with previous research showing that the quality of the items in the test instrument used has pretty good reliability, namely 0.7.(Azizah & Wahyuningsih, 2020; Soeharto & Rosmaiyadi, 2018). Then, in determining the value of the results of the subject's answers, namely referring to the category of mathematical reasoning abilities, among others, as follows:

Table 1.
Category Of Mathematical Reasoning Abilities
(Iswanto et al., 2022)

Category	Achievement
High	$x_i > 70\%$
Medium	$55\% < x_i < 70\%$
Low	$x_i < 55\%$

Based on the results of validity and reliability through the results of the subject description test questions, the researcher bought category codes for high, medium, and low ability levels, namely.

Table 2
Subject Coding

No	Level Mathematical Reasoning Ability	Code
1	High	S1
2	Medium	S2
3	Low	S3

The purpose of coding the subject above is so that the research data results can be categorized according to the researcher's coding.

III. RESULT AND DISCUSSION

After the researcher makes observations to get the results of data analysis through research subjects, the researcher must pay attention to the criteria for achieving mathematical reasoning abilities in the form of a written test. The explanation of the research results found is as follows:

Based on the three research subjects, the level of making predictions for each subject differs. In S1, they have expertise in simplifying the problem correctly through illustrated pictures, but in S2 and S3, they lack expertise in making simple illustrations to solve the problem. The detailed explanations include.

1. S1

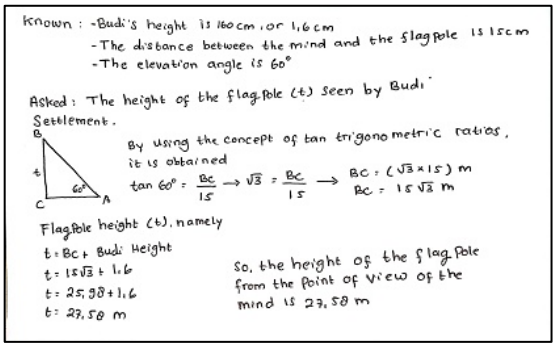

Figure 4. Answer number 1

Based on S1 interviews related to the answers that have been written.

"The concept I use to solve this problem is that first I make a simple illustration to form a right triangle to describe the distance between the mind and the flagpole, then I use the trigonometry ratio formula to get the height of the flagpole, and then the resulting flagpole height is added to the person's height, obtained 27.58".

This is to previous findings, namely students who are lacking in making

illustrations of mathematical models, especially in solving reasoning problem solving, due to a lack of understanding of trigonometry material. (Anggraini & Putra, 2020; Verschaffel et al., 2020). So based on the research results obtained through the answers and interviews above, the researcher found that S1, before solving the problem, S1 first made an illustration in the form of a right triangle, which was then solved using trigonometry comparisons.

2. S2

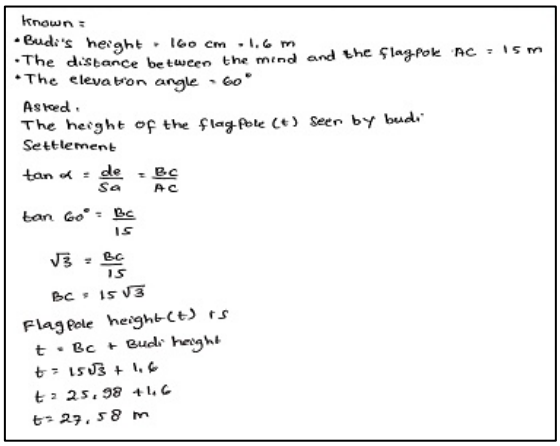

Figure 5. Answer number 1

Based on S2 interviews related to the answers that have been written.

"The concept I use is to go straight to the calculation using the trigonometry ratio formula. After that, I added the height of the mind to get that 27,58 *and did not create a picture illustration to finish it".*

This is consistent with previous findings, namely students who make illustrations of mathematical models make factors for solving reasoning systems and various problems found by students when understanding a concept of trigonometry material (Nanmumpuni & Retnawati, 2021; Schukajlow et al., 2018). So based on the research results obtained through the answers and interviews above, the researcher found that S2, before solving the problem, S2 did not make illustrations first but directly used trigonometry comparison calculations.

3. S3

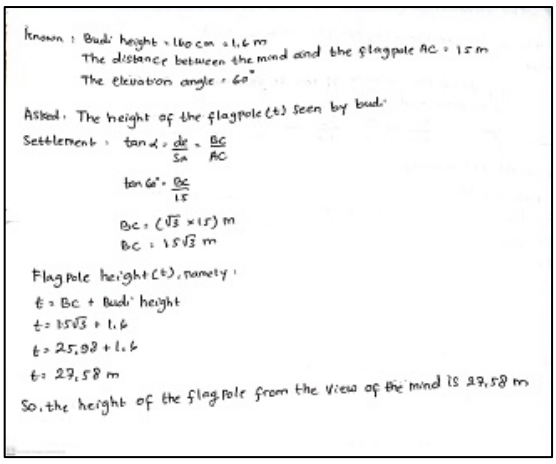

Figure 6. Answer number 1

Based on S3 interviews related to the answers that have been written.

"Look for the height of the flagpole first. After looking for the height of the pole, then add the height of the person, and you get 27,58*".*

This is in accordance with previous findings, namely that almost a third of students can compose questions and their reasons in trigonometry material (Darta et al., 2021; Nggaba, 2020). So based on the research results obtained through the answers and interviews above, the S3, before solving the problem, the S3 did not make an illustration first but directly used the calculation, but the S3 did not know the name of the calculation concept.

The difference between the three subjects in the reasoning indicator is the indicator of making predictions, where S1 can estimate simple shapes through a given case in the form of a right-angled triangle. S2 and S3 had difficulty making a simple form of the case, but S2 and S3 prioritized it in their calculations (Fadillah et al., 2022).

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Based on the three research subjects, each subject's calculation level is different. In S1, they have expertise in completing calculations in detail and correctly, but in S2 and S3, they cannot complete calculations from problems that researchers have presented. The detailed explanations include:

1. S1

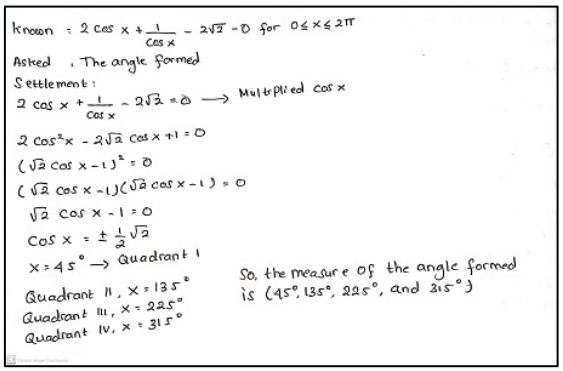

Figure 7. Answer number 2

Based on S1 interviews related to the answers that have been written.

"The concept that I use is to complete the perfect square. After that, it is obtained $\cos x = \pm\frac{1}{2}\sqrt{2}$ *then find the size of the angle from the square of 1 – 4, and it is obtained* $45^o, 135^o, 225^o, 315^o$ *".*

This is in accordance with previous findings, namely the difficulty of students in determining the trigonometry value of an angle (Kamber & Takaci, 2018; Kusuma Dewi et al., 2020). So based on the results of the research obtained through the answers and interviews above that S1 before solving the problem, S1 finds the size of the angle using the concept of completing perfect squares, then adjusts the size of the angle obtained with the rules for the value of the angle using the direction of quadrants 1–4.

2. S2

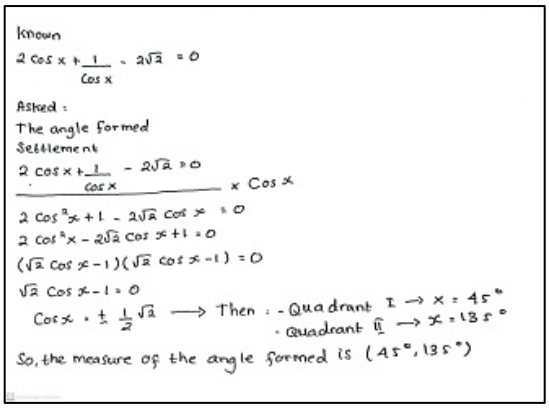

Figure 8. Answer number 2

Based on S2 interviews related to the answers that have been written.

"The concept that I use is the quadratic equation obtained $\cos x = \pm\frac{1}{2}\sqrt{2}$ *then find the size of the angle from the square of 1 – 4, and it is obtained* $45^o, 135^o$ *".*

This is in accordance with previous findings; students can analyze and examine errors found in the answer sheets for trigonometry questions related to determining angles (Hidayati, 2020; Indrawatiningsih et al., 2019). So based on the research results obtained through the answers and interviews above that S2 before solving the problem, S2 looks for the size of the angle using the quadratic equation, but S2 has not yet completed finding the most likely angle from quadrants 1 – 4, where S2 is just looking for the size of the angle from quadrant 1 – 2.

3. S3

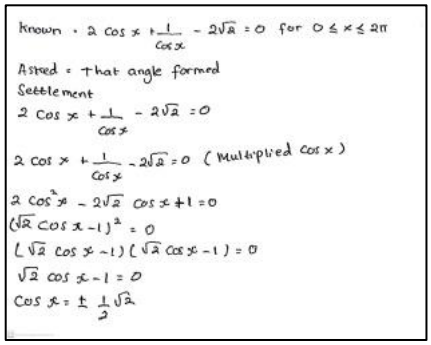

Figure 9. Answer number 2

Based on S3 interviews related to the answers that have been written.

"The concept that I use is solving perfect squares; after that, I get $\cos x = \pm\frac{1}{2}\sqrt{2}$ *then I find the value of the angle using the square direction 1–4. I do not know".*

This is consistent with previous findings, namely, the ability of the five students in trigonometry material is still lacking because students have difficulty modeling trigonometry questions and are stuck with modified questions because many students are unable to complete the answers to the questions given (Azizi & Herman, 2020; Koichu, 2020). So, in line based on the research results obtained through the answers and interviews above that S3 before solving the problem, S3 had not completed finding the most probable angles from quadrants 1 – 4 because S3 did not know or did not memorize determining the size of the angle from the rules of quadrant 1 – 4.

The difference between the three subjects in the reasoning indicator is that the indicator performs calculations, whereas S1 can calculate entirely and accurately. S2 and S3 had difficulty completing the calculations due to a lack of understanding of the trigonometry angle values (Fadillah et al., 2022).

Based on the three research subjects, the researcher found similarities in the level of criteria for making conclusions, where the level of criteria for making conclusions is a collaboration between forecasting and calculation indicators that ends with the certainty of the results of the answers asked, so each subject equally meets the criteria for indicators of reasoning ability correctly. The detailed explanations include.

1. S1

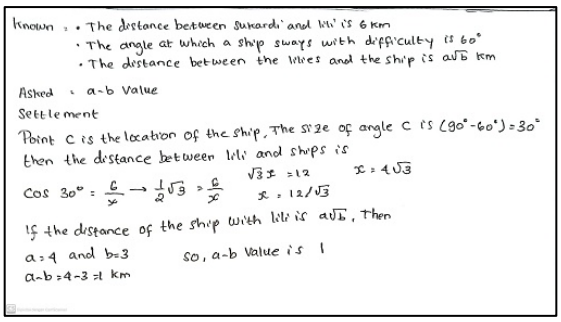
Known : • The distance between Sukardi and Lili is 6 km
• The angle at which a ship sways with difficulty is 60°
• The distance between the lilies and the ship is $a\sqrt{b}$ km
Asked : a-b Value
Settlement
Point C is the location of the ship, The size of angle C is (90°-60°)=30°
then the distance between lili and ships is
$\cos 30° = \frac{6}{x} \rightarrow \frac{1}{2}\sqrt{3} = \frac{6}{x}$ $\quad \sqrt{3}x = 12 \quad x = 4\sqrt{3}$
$x = 12/\sqrt{3}$
If the distance of the ship with lili is $a\sqrt{b}$, Then
a:4 and b=3 so, a-b value is 1
a-b=4-3=1 km

Figure 10. Answer number 3

Based on S1 interviews related to the answers that have been written.

"The concept that I use is the trigonometry ratio formula to determine the distance from the ship and the lily is obtained $4\sqrt{3}$*, because in terms of the rules, if a ship with a lily holder is* $a\sqrt{b}$ *then value* $a = 4$ *and* $b = 3$ *so that* $a - b = 4 - 3 = 1$*".*

This is to the previous findings, namely, the students' factors that cause errors are usually due to the inability of students to interpret the meaning of the questions and the lack of understanding and creativity of students in recognizing real problems such as mathematical models (Anhalt et al., 2018; Mulyani & Muhtadi, 2019). So based on the results of the research obtained through the answers and interviews above that S1 before solving the problem, S1 looked for the value of the distance from the ship to the lily stand through the results of the comparison of trigonometry angles, then adjusted the rules $a\sqrt{b}$ to get the result in question namely $a - b$.

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2. S2

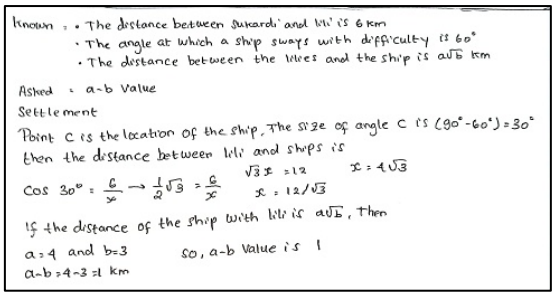

Figure 11. Answer number 3

Based on S2 interviews related to the answers that have been written.

"The concept that I use is the trigonometry ratio formula obtained $x = 4\sqrt{3}$*, because if the sea ship with lilies standing is* $a\sqrt{b}$ *then value* $a = 4$ *and* $b = 3$ *so that* $a - b = 4 - 3 = 1$*".*

This is to previous findings; namely, students do not know how to solve problem number 6 because they think it cannot be solved. After all, the elements they know are incomplete, and they do not know how to find them. (Jatisunda, 2019; Umam & Susandi, 2022). So based on the results of the research obtained through the answers and interviews above that the S2, before solving the problem, the S2 is looking for value x through the results of the comparison of trigonometry angles, but when asked x, S2 only answers the distance asked. After that, S2 adjusts the rules $a\sqrt{b}$ to get the result in question $a - b$. This is what is still incomplete when explaining in interviews the answer sheets that have been made.

3. S3

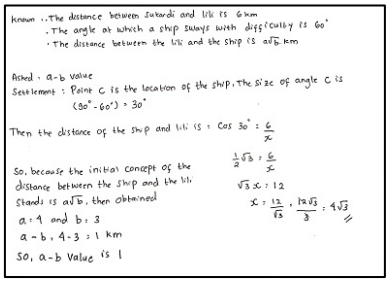

Figure 12. Answer number 3

Based on S3 interviews related to the answers that have been written.

"The concept that I use is the trigonometry ratio formula obtained $4\sqrt{3}$*, because* $a\sqrt{b}$ *then value* $a = 4$ *dan* $b = 3$ *so that* $a - b = 4 - 3 = 1$*".*

This is in accordance with previous findings; students do not know how to work on the problem because students think that the problem cannot be solved. After all, the elements they know are incomplete, and they do not know how to look for them (Jatisunda, 2019; Umam & Susandi, 2022). So, based on the results of the research obtained through the answers and interviews above that it is the same as with S2 and S3 before solving the problem, S3 looks for grades $4\sqrt{3}$ in determining the distance between the ship and Lili, but when asked $4\sqrt{3}$ where did you get it from? S3 only answers from the results of the value x which uses trigonometry formulas. After getting the value x, then S3 adjusted the rules $a\sqrt{b}$ to get the result in question $a - b$. This is what is still incomplete when explaining in interviews the answer sheets that have been made.

The difference between the three subjects in the reasoning indicator is in the indicator of making conclusions, which is a collaboration between calculations and forecasts. The difference only lies in the way of explaining it, which is different at the time of being interviewed, but in calculations, forecasts, and sentences, the conclusions are correct (Fadillah et al., 2022).

Based on the presentation of the three subjects related to indicators of reasoning ability, namely making predictions, calculations, and conclusions in numbers 1, 2, and 3, among others, are as follows.

Table 3.
Presentation of Research Data for Each Indicator of Reasoning Ability

Subject	Reasoning Ability Indicator		
	Making Forecasts	Perform Calculations	Making Conclusions
S1	Able to make accurate model illustrations using simple concepts, namely right triangles	Determine the angle size using the concept of completing a perfect square, then adjust the size of the angle obtained with the 1-4 quadrant angle rule.	Able to determine the value of the distance from the ship to the lily stands through the results of trigonometry angle comparisons, then adjust the rules $a\sqrt{b}$ To get the result asked, namely a-b
S2	Not making illustrations first but directly using trigonometry comparison calculations.	Finding the angle size using the quadratic equation, but S2 is not yet complete in finding the most likely angle from quadrants 1 – 4, whereas S2 is just finding the angle size from quadrants 1 – 2.	Only answered the distance asked, then when conducting the interview, the subject was incomplete when explaining the results of the answer sheets that had been made.
S3	Did not make an illustration beforehand but immediately used the calculation, but S3 did not know the name of the calculation concept.	The subject has not completed finding the most probable angle from quadrants 1-4, because S3 does not know or does not memorize the size of the angle from the rules of quadrants 1-4.	Still incomplete when explained in interviews on the answer sheets that have been made.

Based on the Table 3, the level of reasoning ability of all subjects is different. It can be seen from the results of coding the level of reasoning ability associated with resilience that S1 is included in the high category. In previous research conducted by Sari and Untarti in 2021, it was found that students who have mathematical resilience are in the high category, so they can provide a variety of different solutions and be detailed (Maknun, 2020; Sari & Untarti, 2021). It can be proven that S1 has fulfilled all indicators of reasoning abilities correctly and in accordance with the wishes of the researcher.

According to the results of coding the level of reasoning ability related to resilience, the level of mathematical resilience of students at S2 is in the moderate category. In previous research in 2021, students with moderate mathematical resilience were able to produce more than one different solution with answers that were systematic but not detailed (Fitriana et al., 2022; Sari & Untarti, 2021)). This is in line with the actual situation of Masters, where it can be proven that Masters has fulfilled several indicators of mathematical reasoning ability from the results of students' answers, namely the indicators of calculations and conclusions. However, in making predictions, they are pretty lacking in mastering them.

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After that, based on the results of coding the level of mathematical reasoning ability related to resilience, the level of mathematical resilience of students in S3 is in the low category. In previous research conducted by Sari and Untarti in 2021, students with low mathematical resilience could solve problems with systematic answers (Sari & Untarti, 2021; Zulkarnain et al., 2020; Shapiro, 2000). This is a difference found by researchers, where S3 is still lacking in fulfilling all indicators of reasoning ability, where there are results of unfinished answers, and where S3 has difficulty understanding the solving techniques of the questions given. So, it can be determined that based on the results of data processing using a student mathematical resilience questionnaire and the results of the answers to the reasoning ability indicator tests, there is alignment with the categories of students' mathematical resilience levels that have been determined, namely high, medium, and low categories.

IV. CONCLUSION

Based on the analysis and results of the research, the researcher can conclude that the indicator of the highest reasoning ability is the ability to perform calculations. From the results of the worksheets, the average subject can perform calculations with various concepts used by each subject, such as the concept of trigonometry comparisons, trigonometry quadratic equations, and quadratic trigonometry. Meanwhile, the lowest indicator is the indicator for making predictions and conclusions because, from the results of the subject's answers, there are still few who can make mathematical models and deficiencies in simplifying the concept of solving each problem given in questions, such as in making illustrations of flagpoles and the distance of a ship to a person's distance. The research results related to the level of reasoning ability associated with resilience are that all subjects have different levels of ability. It can be seen from the coding results that S1 is included in the high category, proving that S1 has fulfilled all indicators of reasoning ability correctly and in accordance with the researcher's wishes. Then the results of coding the level of reasoning ability related to resilience, the level of mathematical resilience of Masters students is in the medium category, which can be proven that Masters has fulfilled several indicators of mathematical reasoning ability from the results of student answers, namely indicators of calculations and conclusions. However, in making predictions, it is pretty lacking in mastering them. After that, the results of coding the level of mathematical reasoning ability related to resilience, the level of mathematical resilience of S3 students is in the low category, where S3 has difficulty understanding the problem-solving techniques given. Suggestions for future researchers if interested in this title: so that there is special handling for more detail when supervising student work, then looking for other theories to analyze more deeply about resilience in materials other than trigonometry. Then it is hoped that this research can become a teacher's reference in determining learning methods

according to mathematical reasoning abilities and resilience.

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