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**Article**

# ABILITY OF FEMALE STUDENTS IN SOLVING PYTHAGORAS THEOREM PROBLEMS GIVEN MATHEMATICS LEARNING OUTCOMES

**Umi Nadziroh[1], Syaiful Hadi[2]**

Tadris Masters Program in Mathematics, UIN Sayyid Ali Rahmatullah Tulungagung

Postgraduate Program

Jalan Mayor Sujadi Timur No. 46 Tulungagung

E-mail: unadzira09@gmail.com, syaifulhadi08@gmail.com

**ABSTRACT:**

This research was motivated by the diverse abilities of female students in learning mathematics, especially solving Pythagorean theorem problems given by the teacher or those in the Student Worksheets based on students learning outcomes in mathematics. This study aims to describe the ability of female students to solve Pythagorean theorem problems in terms of their mathematics learning outcomes at MTs Negeri 9 Blitar. This study uses a qualitative approach to the type of case study. The subjects in this study were 6 class VIII female students at MTs Negeri 9 Blitar. Data collection techniques using tests, interviews, and documentation. Data analysis techniques use the Miles and Huberman models. The results of the study showed that female students with high learning outcomes were able to carry out four implementations of Polya's steps in solving problems which included: understanding the problem, developing a solution plan, carrying out the settlement plan, and re-examining the solutions obtained. Female students with moderate learning outcomes can carry out three implementations of Polya's steps in solving problems which include: understanding the problem, developing a solution plan, and re-examining the solutions obtained. Female students with low learning outcomes can carry out two applications of Polya's steps in solving problems which include: understanding the problem and re-examining the solutions obtained.

**Keywords:** female students, ability to solve problems, learning outcomes of mathematics.

## INTRODUCTION

Mathematics is one of the oldest sciences and is considered the mother of various knowledge. In the world of education, mathematics is considered a big challenge that is difficult for some students. Subjects are always avoided and hated by students. But some make mathematics an easy and fun science, namely the presence of several students who often win mathematics Olympiads at both the national and international scale.

According to Sriyanto, several reasons are often conveyed related to students fear of learning mathematics, including because mathematics is in the form of theory and abstract, many formulas, the contents are only calculations, the influence of general perception, there are killer teachers, mathematics is only for smart children and competitive children.[1]

Mathematics as a scientific discipline relies on very good thinking processes to be taught to students, it contains various aspects that substantially guide students to think logically, according to patterns and rules that have been arranged in a standard way so that often the goal of teaching mathematics is nothing but to familiarize students to think logically, critically and systematically.[2]

Mathematics is one of the compulsory subjects at every level of education, both elementary, middle, and high school. Mathematics is related to solving mathematical problems that we often experience in everyday life. Therefore it is necessary to increase the ability to learn mathematics. Learning in schools is not only centered on the teacher. The active role of students becomes decisive in the success of learning mathematics. Learning ability is the basis for solving mathematical problems in learning.

This is supported by the National Council of Teachers of Mathematics (NCTM) that mathematics learning standards consist of problem-solving abilities, reasoning skills and evidence (reasoning), communication skills, connection skills, and representation abilities).[3] The importance of problem-solving is reinforced by Wilson's statement in the National Council of Teachers Mathematics (NCTM) that "problem-solving has special importance in the study of mathematics. A primary goal of teaching and learning mathematics is to develop the ability to solve a wide variety of complex mathematics problems".[4]

Students ability to solve problems is one of the objectives of learning mathematics that must be achieved by students. With the ability to solve problems, students will learn to find and develop an alternative solution to the problem at hand. Often we find if there is a difficult problem solving then students learning abilities must be improved. The ease and difficulty of the solution to be used in solving student-centered problems. In the content standards of Permendiknas No. 22 of 2006, it is stated that the ability to solve mathematical problems which includes the ability to understand problems, design mathematical models, complete models, and interpret solutions obtained is one of the objectives of the mathematics subject.

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[1] Sriyanto, *Strategi Sukses Menguasai Matematika*, (Jakarta: PT Buku Kita, 2007), 15.

[2] Ali Syahbana, "Peningkatan Kemampuan Berpikir Kritis Matematika Siswa SMP Melalui Pendekatan *Contextual Teaching and Learning*," dalam *Jurnal Edumatica* 2, (2012): 46.

[3] NCTM, *Principles and Standards for School Mathematics*, (USA: The National Council of Teacher Mathematics Inc, 2000).

[4] Wilson, *Mathematical Problem Solving*, (New York: Macmilan Publishing Company, 1993), 57.

In learning mathematics problem solving is important. Because the problems in mathematics cannot be solved through rote learning, even in an instant way. According to Tarhadi problem solving is a way of thinking, analyzing, and reasoning using experience and knowledge related to the problem.[5]

Problem-solving is a human activity that combines previously acquired concepts and rules and is not a generic skill that can be acquired instantly.[6] Meanwhile, another definition states that the ability to solve problems is a process that is taken by someone to solve the problems they face.[7] Sri Ari Widodo stated that problem-solving is a process used to solve problems. Problems occur if a student does not have rules that can be used to overcome the gap between the current situation and the goals to be achieved. The ability to solve a problem is a cognitive ability at a high level. Another thing, Yeni Candra Vilianti, et al stated that solving problems in mathematics requires systematic solutions to solve them. Understanding math problems is very necessary for solving problems, with understanding it will make it easier for students to solve these math problems.[8] According to Polya, in solving a problem 4 steps must be taken, namely understanding the problem, devising a plan, implementing a settlement plan (carrying out the plan), and re-examining the solutions obtained (looking back).[9]

Meanwhile, according to Holmes, there are two groups of problems in learning mathematics in SMP/MTs, namely routine problems, and non-routine problems. For routine problems, including tasks that can be solved by substituting data into general solutions. Solving the problems used are also in easy steps and processes. Students can see and understand the previous examples discussed before solving the given problem. Non-routine problems can sometimes have more than one solution. These problems are sometimes related to living conditions and situations. So solving the problem requires a deep process.[10]

One of the test results that measure students problem-solving abilities can be seen from the results of tests conducted by international studies, namely the Program for International Student Assessment (PISA). Indonesia has taken the PISA test since 2000. In 2018 Indonesia's PISA score for mathematics was around 379 with an OECD average score of 487. As a

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[5] Rifa Wahyu Riani, "Analisis Proses Pemecahan Masalah Siswa Program Akselerasi dan Kelas Reguler di SMPN 3 Malang," dalam *Skripsi*, (2019): 6.

[6] Ratna Wilis Dahar, *Teori-teori Belajar dan Pembelajaran*, (Jakarta: Erlangga, 2011), 141.

[7] Santika Lya Diah Pramesti dan Juwita Rini, "Analisis Kemampuan Pemecahan Masalah Peserta Didik Berdasarkan Strategi Polya pada Model Pembelajaran *Problem Based Learning* Berbasis *Hands On Activity*," dalam *Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang* 3, no. 2 (2019): 224-236.

[8] Indri Anugraheni, "Pengaruh Pembelajaran Problem Solving Model Polya Terhadap Kemampuan Memecahkan Masalah Matematika Mahasiswa," dalam *Jurnal Pendidikan* 4, no. 3 (2019): 1-6.

[9] Novika Rahmawati dan Maryono, "Pemecahan Masalah Matematika Bentuk Soal Cerita Berdasarkan Model Polya pada Siswa Kelas VIII MTs Materi Pokok SPLDV," dalam *Jurnal Tadris Matematika* 1, no. 1 (2018): 24.

[10] Rifa Wahyu Riani, "Analisis Proses Pemecahan …, 6.

comparison, China and Singapore ranked high for mathematics scores with scores of 591 and 569. Likewise with achievements declining math skills. In 2003 achievement of the PISA mathematics score was 360, rising to a score of 371, and in 2009 and 2012 the score was 375. After the peak in 2015 with a score of 386, Indonesia's PISA mathematics score again fell to 379. Indonesia's mathematics competency achievement is still 71 % below the minimum competence.[11]

One of the influential factors in learning mathematics is the gender of the student (gender). Gender differences certainly cause physiological differences and affect psychological differences in learning. So male and female students certainly have many differences in learning mathematics, especially in solving problems.[12]

According to Susento, gender differences not only result in differences in the ability to solve problems in mathematics, but also in the way of acquiring mathematical knowledge.[13] Keitel states that gender, society, and culture influence the learning of mathematics. Men and women have differences in learning attitudes, for example, women usually use more learning strategies than men. There is no essential difference between the abilities of men and women, but the differences in the attitudes of men and women make a difference in implementing learning strategies.[14]

Differences in the ability of male and female students to solve problems will also affect the results of learning mathematics itself. Student learning outcomes are influenced by learning aptitude, time available to study, individual abilities, quality of teaching, and environment. While Bloom divides learning outcomes into three, namely cognitive, affective and psychomotor.[15]

According to Ruseffendi the success of students in a lesson also depends on the readiness of the child. There are two kinds of child readiness, namely ready mental development and prerequisite knowledge. Students cannot understand arithmetic if they cannot understand the law of conservation of numbers (mental development is not ready) and they will not understand quadratic equations if they do not understand linear equations (no prerequisite knowledge).[16]

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[11] Yohanes Enggar Harususilo, *"Skor PISA Terbaru Indonesia, Ini 5 PR Besar Pendidikan pada Era Nadiem Makarim*," (Kompas, 4 Desember, 2019).

[12] Zubaidah Amir MZ, "Perspektif Gender Dalam Pembelajaran Matematika," dalam *Jurnal Marwah* 12, no. 1 (2013): 14-31.

[13] Susento, "Mekanisme Interaksi Antara Pengalaman Kultural-Matematis, Proses Kognitif, dan Topangan dalam Reivensi Terbimbing," dalam *Disertasi*, (Surabaya: Unesa, 2006).

[14] Ita Mafajatul Aliyah, dkk., "Kemampuan Koneksi Matematis Siswa Ditinjau dari Kemampuan Awal dan Gender," dalam *Jurnal Didaktik Matematika* 6, no. 2 (2019), 161-178.

[15] Witri Lestari, "Pengaruh Kemampuan Awal Matematika dan Motivasi Belajar Terhadap Hasil Belajar Matematika," dalam *Jurnal Analisa* 3, no. 1 (2017): 76-84.

[16] Russefendi, *Pengajaran Matematika Modern*, (Bandung: Tarsito, 2004), 10.

Every educational institution throughout Indonesia is currently implementing the 2013 curriculum, where every student is expected to be active in learning. Based on the 2013 curriculum, one of the materials taught in class VIII SMP/MTs in even semesters is the Pythagorean theorem. The Pythagorean theorem states that in a right triangle the sum of the squares of the sides is equal to the square of the hypotenuse.[17]

When learning in class takes place, it is often found that female students are more active in solving problems from the questions given by the teacher or those contained in the Student Worksheet (LKS). Based on the researchers initial observations and interviews with mathematics teachers, not all female students at MTs Negeri 9 Blitar have the same abilities in learning mathematics, especially in solving problems. Some students have high, medium, and low categories of mathematical ability. So with the varying abilities of female students, student learning outcomes also vary.

Based on the description above, the researcher is interested in conducting research with the title "Ability of Female Students in Solving Pythagorean Theorem Problems given Mathematics Learning Outcomes".

## RESEARCH METHODS

The approach used in this study is qualitative with a case study type of research. Because basically, this study describes the ability of female students in the high, medium, and low categories in solving Pythagorean theorem problems in terms of learning outcomes in mathematics.

The subjects in this study were students of class VIII at MTs Negeri 9 Blitar which consisted of 6 female students and were selected heterogeneously. Research subjects will be given written test questions. In this study, researchers determined students mathematical abilities by dividing them into 3 categories, namely, high, medium, and low categories. This categorization is seen from the results of student test scores. In categorizing, the researcher uses a reference for calculating the average value (mean) and standard deviation/standard deviation.

In this study, there were two instruments used in collecting data. First, is the researcher himself as the first instrument. Second, in the form of test questions, interview guides, audio recording devices, and documentation as auxiliary instruments.

Data analysis in this study uses the Miles and Huberman model which includes three stages, namely:

a. Data reduction

[17] Kementerian Pendidikan dan Kebudayaan, *Matematika SMP/MTs Kelas VIII Semester 2 Edisi Revisi 2017*, (Jakarta: Kementerian Pendidikan dan Kebudayaan, 2017), 44.

Data reduction was carried out after reading, studying, and reviewing test results and student interview results. Data reduction referred to in this research is an activity that refers to the process of selecting, focusing attention, and simplifying raw data in the field about students abilities to obtain data on problem-solving abilities.

b. Display Data

At this stage, the researcher presents data that is the result of data reduction. The data presented is data in the form of descriptions of test results and results of interviews with students with descriptions per subject.

c. Data verification

After the data is presented, the next stage is concluding. This conclusion refers to the problem-solving model criteria according to Polya. First, understand the problem. Second, develop a settlement plan. Third, implement the settlement plan. Fourth, re-examine the solutions obtained.

Based on these criteria, a description of the student's ability to solve the given problem is made.

## RESULTS AND DISCUSSION

Following the research objectives, this section will present the results of research on the ability of female students to solve Pythagorean theorem problems in terms of learning outcomes in mathematics.

From the research subjects with 6 female students, 2 students will be selected in the high category, 2 students in the medium category, and 2 students in the low category. This grouping is seen based on the results of student tests.

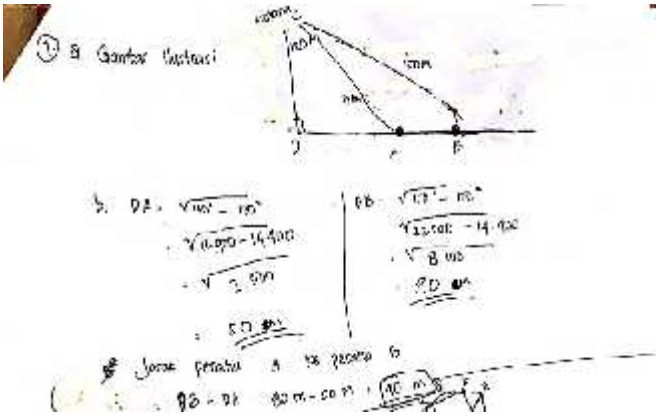
**Table 1 List of Students Selected as Research Subjects**

| Number | Student Code | L/P | Category |
|---|---|---|---|
| 1 | MNT | P | High |
| 2 | NR | P | Moderate |
| 3 | ASD | P | Low |

### A. Presentation of Data on Test Results and Interviews of Students in the High Mathematics Ability Category of MNT Subjects on Test Question Number 1

Below is the answer sheet from the MNT subject for test question number 1.

**Figure 1 Answers to Test Question Number 1 MNT Subject**



Exposure to MNT subject data in solving problems with Polya's steps as follows:

1. Understanding the problem

   From the answer sheet, the MNT subject draws a right triangle in understanding the problem. After that, the MNT subject wrote down each point A, B, C, and D at each corner of the triangle. And also write down the distance between boat A and the spire (C) 130 m, and the distance between boat B and the spire (C) 150 m.

   On the MNT subject's answer sheet, do not write down anything that is known and asked in the problem. However, when researchers conduct interviews, MNT subjects can answer what is known and asked in the questions.

   Based on the results of the interviews, the MNT subject was able to state what was known in the problem, namely the height of 120 m, the distance of boat A was 130 m and the distance of boat B was 150 m. The MNT subject can also mention what is being asked in the problem, namely making an illustration of the picture and determining the distance between boat A and boat B.

   The MNT subject's ability to understand problems is in a high category, due to being able to answer all known and asked information along with complete and correct visualization of the problem.

2. Develop a settlement plan

   MNT subjects found a formula that can be used to solve the problem, namely by using the Pythagorean formula by writing $D = \sqrt{130^2 - 120^2}$ and $D = \sqrt{130^2 - 120^2}$. The answer is as shown in the image of the MNT answer sheet.

   Based on the interview results, the MNT subject can determine alternative solutions, namely by using the Pythagorean theorem formula.

   The ability of the MNT subject in preparing a settlement plan is in the high category, due to being able to find the right formula. Even though the MNT subject did not write down the initial formula, they already understood what had to be done.

3. Execute the settlement plan

After finding the Pythagorean theorem formula used in solving problems, MNT subjects can explain how to use the formula. It can be seen from the written answer sheet that by entering the numbers into the Pythagorean theorem formula $D = \sqrt{16900 - 14400}$ to obtain $D = 50\ m$ and $D = \sqrt{22500 - 14400}$ then the result $D = 90\ m$. MNT does not make mistakes in either the completion steps or the arithmetic operations.

Based on the interview results, the MNT subject drew a right-angled triangle so that he found the distance using the Pythagorean theorem formula.

The MNT subject's ability to carry out plans is in a high category, due to being able to find unknown sides of the illustrations made, namely the DA side and the DB side. In addition, the MNT subject is also able to make substitutions and calculations correctly without any errors and to write down units (m) for each side length found.

4. Re-check the solution obtained

The MNT subject goes back to checking step by step before arriving at a final solution. The way to do this is to find a match between the solution and what is known. After finding the results of the DB and DA calculations, the MNT subject looked for the distance between boat A and boat B using $D - D = 90 - 50$ which obtained a calculation result of 40 m.

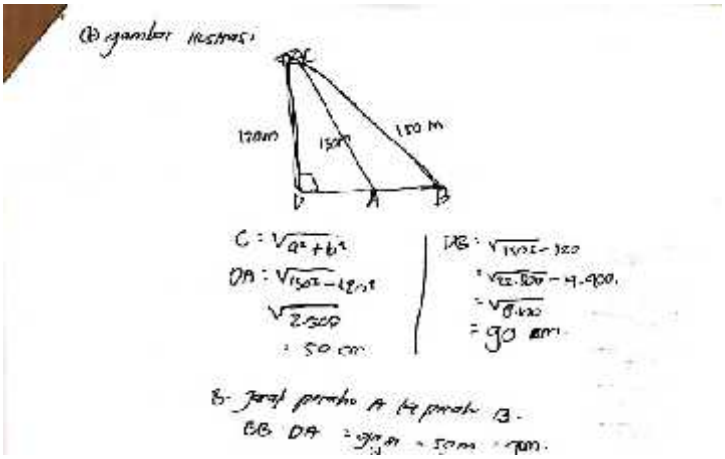
Based on the results of the interviews, the MNT subjects were able to find the distance between boat A and boat B using the Pythagorean theorem formula.

The ability of the MNT subject to re-check answers is in a high category because the MNT subject reviews the answers obtained by researching or re-checking the answers. The subject also found the correct answer and answered the conclusion obtained.

**B. Presentation of Data on Test Results and Interviews of Students in the Moderate Mathematics Ability Category of NR Subjects on Test Question Number 1**

Below is the answer sheet from the NR subject for test question number 1.

**Figure 2 Answers to Test Question Number 1 Subject NR**




Exposure to NR subject data in solving problems with Polya's steps as follows:

1. Understanding the problem

   In answer sheet number 1 above, it can be seen that subject NR draws a triangular shape. With points A, B, C, and D and the distance between points B to C as far as 150 m, the distance between point A to point C as far as 130 m, and the distance between point D to point C as far as 120 m. From the answer sheet, the NR subject did not write down anything that was known and asked in question number 1. Even so, during the interview, the NR subject could answer what was known and ask about the problem.

   Based on the interview results, the NR subject was able to state what was known in the problem, namely the height of 120 m, the distance of boat A was 130 m and the distance of boat B was 150 m. The NR subject can also mention what is being asked in the problem, namely making an illustration of the picture and determining the distance between boat A and boat B.

   The NR subject's ability to understand problems is in a high category, due to being able to answer all known and asked information. In addition, the NR subject can make illustrations completely and correctly.

2. Develop a settlement plan

   Subject NR found an idea to work on the problem, namely by using the Pythagorean theorem formula $c = \sqrt{a^2 + b^2}$, so that $D = \sqrt{130^2 - 120^2}$ and $D = \sqrt{150^2 - 120^2}$.

   Based on the results of the interviews, the NR subject can determine alternative solutions, namely by using the Pythagorean theorem formula.

The NR subject's ability to formulate plans is in a high category, due to being able to find the right and correct formula. Subject NR also wrote down the initial formula, namely $c = \sqrt{a^2 + b^2}$.

3. Execute the settlement plan

   NR subjects can also explain their work logically. The NR subject uses the Pythagorean formula to substitute the known distance, namely $D = \sqrt{22500 - 14400}$. So the result of $D = 50$and $D = 90$.

   Based on the interview results, subject NR drew a right-angled triangle so that he found the distance using the Pythagorean theorem formula.

   The NR subject's ability to carry out plans is in a high category, due to being able to substitute each number into the formula, the calculations are correct. In addition, the NR subject found the side lengths of DA and DB and wrote down the units.

4. Re-check the solution obtained

   The NR subject also evaluates and corrects the results of the work. By using the Pythagorean formula, subject NR corrected all calculations from the start so that there were no errors. Meanwhile, to find the distance between the NR subject boats using the formula $D - D = 90 - 50 = 50$. So, the distance between boat A and boat B is 50 m.

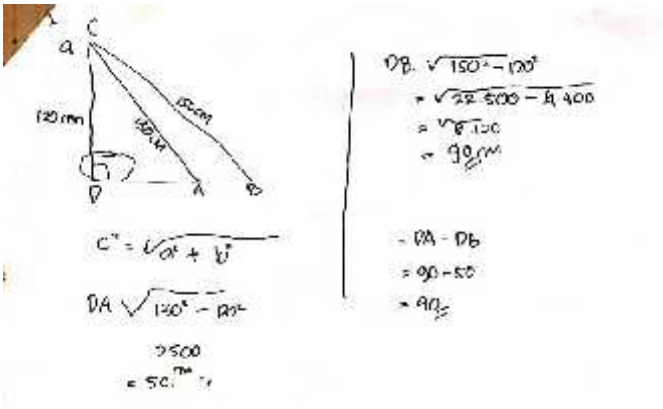
   Based on the interview results, the NR subject was able to find the distance between boat A and boat B using the Pythagorean theorem formula.

   The ability of the NR subject to re-examine is categorized as high because it can answer the solutions obtained. Subject NR found the distance between the boats correctly. The calculations are carried out correctly and also include the units (m).

**C. Presentation of Data on Test Results and Interviews of Students in the Low Mathematics Ability Category of ASD Subjects in Test Question Number 1.**

Below is an answer sheet from an ASD subject for test question number 1.

**Figure 3 Answers to Test Question Number 1 ASD Subjects**



Exposure to ASD subject data in solving problems with Polya's steps as follows:

1. Understanding the problem

   In answer sheet, number 1 above it can be seen that the ASD subject draws a triangular shape. With points A, B, C, and D and the distance between points B to C as far as 150 m, the distance between point A to point C as far as 130 m, and the distance between point D to point C as far as 120 m.

   At this stage, it can be seen from the answer sheet that the ASD subject did not write down anything that was known and asked in test question number 1. Even so, during the interview, the ASD subject was able to answer what was known and asked about the problem.

   Based on the results of the interviews, ASD subjects were able to state what was known in the problem, namely the height of 120 m, the distance of boat A was 130 m and the distance of boat B was 150 m. ASD subjects can also mention what is being asked in the problem, namely making a picture illustration and determining the distance between boat A and boat B.

   The ability of ASD subjects to understand problems is in the high category because they can make illustrations completely and correctly. In addition, ASD subjects were able to answer all known and asked information.

2. Develop a settlement plan

   ASD subjects found ideas to work on problems, namely the Pythagorean theorem formula $c = \sqrt{a^2 + b^2}$. So $D = \sqrt{130^2 - 120^2}$ and $D = \sqrt{150^2 - 120^2}$.

   Based on the interview results, ASD subjects can determine alternative solutions, namely by using the Pythagorean theorem formula.

The ability of ASD subjects to formulate plans is in a high category because they can find the correct and correct formula. The formula is to find the side lengths of DA and DB.

3. Execute the settlement plan

ASD subjects can also explain their work logically. ASD subjects used the Pythagorean formula to substitute the known distance, namely $D = \sqrt{22500 - 14400}$ . So the result of $D = 50$ and $D = 90$.

Based on the interview results, the ASD subject drew a right-angled triangle so that he found the distance using the Pythagorean theorem formula.

The ability of ASD subjects to carry out plans is in a high category because they can explain the methods taken. The results of the substitution and calculations performed are also correct.

4. Re-check the solution obtained

ASD subjects also evaluate and correct work results. By using the Pythagorean formula, the ASD subject corrected all calculations from the start so that there were no errors. Meanwhile, to find the distance between the boats of the ASD subject, use the formula $D - D = 90 - 50 = 50$. So, the distance between boat A and boat B is 50 m.

Based on the interview results, ASD subjects were able to find the distance between boat A and boat B using the Pythagorean theorem formula.

The ASD subject's ability to check again is in a high category, because the ASD subject writes the formula correctly, and finds the final result correctly. However, do not write units (m) in the results. ASD subjects were able to answer the conclusions obtained.

From all the results of exposure to data based on test results and the results of interviews with research subjects, the following outline is obtained:

a. Ability of High Category Female Students to Solving Problems

Female students with high-category math skills were able to understand the core problem of the questions given. This is shown by female students being able to mention all the information that is known and asked in the test questions given. As well as being able to make illustrations correctly and precisely.

Female students with high-category mathematical ability can formulate a solution plan. This is indicated by female students being able to find the formula used in solving problems from the test questions given.

Female students with high-category mathematical ability can carry out the settlement plan. This is shown by female students being able to substitute numbers into the formula they have found. In addition, the calculation process and the final results obtained are following what is asked in the test questions.

Female students with high mathematical abilities can re-examine the solutions obtained. This is indicated by female students being able to re-check the steps and formulas used and draw conclusions from the problems given.

Based on the discussion above, it can be concluded that female students with high learning outcomes can carry out four implementations of Polya's steps in solving problems which include: understanding the problem, developing a solution plan, carrying out the settlement plan, and re-examining the solutions obtained.

b. The Ability of Female Students in the Medium Category in Solving Problems

Female students with an average category of mathematical abilities can understand the core problem of the questions given. This is shown by female students being able to mention all the information that is known and asked in the test questions given. As well as being able to make illustrations correctly and precisely.

Female students with an average category of mathematical abilities can formulate a solution plan. This is indicated by female students being able to find the formula used in solving problems from the test questions given.

Female students with an average category of mathematical abilities have not been able to carry out the settlement plan properly. This is shown by female students being able to substitute numbers into the formula that has been found, but the calculations are still not correct and precise because the accuracy in writing is still lacking.

Female students with moderate mathematical abilities can re-examine the solutions obtained. This is indicated by female students being able to re-check the steps and formulas used and draw conclusions from the problems given. Even though there are errors in the calculations, correcting them can be done.

Based on the discussion above, it can be concluded that female students with moderate learning outcomes can carry out three implementations of Polya's steps in solving problems which include: understanding the problem, developing a settlement plan, and re-examining the solutions obtained.

c. The ability of female students in the low category to solve problems

Female students with low mathematical abilities were able to understand the core problem of the questions given. This is shown by female students being able to mention all

the information that is known and asked in the test questions given. As well as being able to make illustrations correctly and precisely.

Female students with low-category math abilities have not been able to formulate a settlement plan. This is indicated by female students who are still hesitant in finding the formula used in solving problems from the test questions given.

Female students with low-category math abilities have not been able to carry out the settlement plan properly. This is shown by the confusion of female students in explaining how to use the formula that has been found. So that the solution obtained is not correct and appropriate.

Female students with low mathematical abilities can re-examine the solutions obtained. This is indicated by female students being able to re-check the steps and formulas used and draw conclusions from the problems given. Even though the previous steps were confusing in solving the problem.

Based on the discussion above, it can be concluded that female students with low learning outcomes can carry out two applications of Polya's steps in solving problems which include: understanding the problem and re-examining the solutions obtained.

## CONCLUSION

Based on the results and discussion of the research that has been stated previously, the following conclusions are obtained:

1. Female students with high learning outcomes can carry out the four implementations of Polya's steps in solving problems which include: understanding the problem, developing a solution plan, implementing the settlement plan, and re-examining the solutions obtained.
2. Female students with average learning outcomes can carry out three implementations of Polya's steps in solving problems which include: understanding the problem, developing a solution plan, and re-examining the solutions obtained.
3. Female students with low learning outcomes can carry out two applications of Polya's steps in solving problems which include: understanding the problem and re-examining the solutions obtained.

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