Analysis of students’ problem-solving ability in solving geometry problem

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Abstract. This study aimed to describe the students’ problem-solving ability in solving Geometry problems. This research was a qualitative descriptive study with 6 students as research subjects at SMP Negeri 1 Piyungan Bantul. The data collection methods used in this research were tests and interviews. This research used the triangulation method to determine the validity of data which was obtained by the researcher. The results showed that the percentage score for the indicator of understanding the problem was 31.48%, planning strategies to solve problems was 57.41%, implementing strategies to solve problems was 55.56%, and concluding was 31.48%. At the level of problem-solving ability, there is one high category student, 3 medium category students, and 2 low category students. This is because students lack self-confidence, lack of understanding of problems, weakness in understanding concepts, principles, and mathematical formulas of geometric material, and lack of skills in calculations. Therefore, it is necessary to provide more and more complex questions so that students are familiar with various kinds of non-routine questions. Also, it is necessary to have an understanding of mathematical concepts, principles, and formulas so that they do not have a negative impact on students in solving advanced material geometry problems.

1. Introduction
Education is one of the most important needs so that almost all aspects of life require education. Education is an effort to provide certain knowledge, insights, skills, and expertise to individuals to develop their talents and personalities. With education, humans will try to develop themselves so that they can face any changes that occur as a result of advances in science and technology. Mathematics is one of the subjects that must be studied through education, so mathematics is given to all students from elementary to high school.

Paying attention to the importance of mathematics as an interesting subject to study in a school in a way that is not known to students but has the necessary information, it is very important to emphasize mathematics to all students to have good problem-solving skills as evidence that students have understood mathematics subject matter which has been given by the teacher [1] [2]. However, it is very concerning because mathematics is one of the subjects that most students fear [3]. This can be seen from Indonesia's participation in Trends in International Mathematics and Science Study (TIMSS) since 1999 showing that the achievements of Indonesian children are not encouraging. The TIMSS assessment framework for junior high school students is divided into two dimensions, namely the content dimension and the cognitive dimension. The cognitive dimension, consists of three domains, namely facts and procedures, using concepts, and solving routine problems, and solving non-routine problems. Besides, at the national level, the results of 2018/2019 National Examination were also not encouraging. This
happens because of the students' lack of ability to understand the problem to determine the solution to the problem [4]. Meanwhile, learning mathematics aims to equip students to make observations, find, and solve problems and then discuss these solutions with their friends [5]. This is supported by other research that shows that the provision of mathematical problem-solving problems that have been developed will have a potential effect on exploring students in solving problems [6].

Problem solving and reasoning are also one of the main goals in mathematics [7]. In Singapore, the ability to solve problems is the main goal of learning mathematics [8]. Problem-solving is an integral part of learning mathematics, so it should not be eliminated from mathematics [9]. This means that these skills are important to have and be developed by students [4]. Problems are defined as situations where there are goals to be achieved and the steps to achieve these goals are not easy, because in solving these problems students do not sufficiently imitate how to solve problems that students already know but must make efforts such as modifying problems, solving problems into several problems, known, or reformulate non-routine problems into known (routine) problems [10]. Students can solve mathematical problems if they have a suitable schema for problem-solving [11]. Schemes are built from meaningful knowledge of relevant concepts, experience in solving problems, understanding of the problems to be solved, and knowledge of problem-solving approaches or strategies [12-13]. Besides, schemes are also built from contextual problems that require students to connect their mathematical knowledge in solving daily life problems which are believed to affect students' problem-solving skills [6]. When students are trying to solve math problems, students are facing challenges because students are faced with problems they have never encountered [14]. Mathematical problem-solving skills are the skills to find a method or approach to solving by observing and understanding a problem followed by trying and guessing and finding and reviewing it [15]. There are several skills in mathematical problem solving, namely problem-solving skills for routine, non-routine, applied routine, applied non-routine, applied routine problems, and applied non-routine problems [16]. One of the problem-solving methods as an alternative to facilitate students in learning is problem-solving found by Polya [17]. Polya explained several steps in problem-solving, namely: 1) understand the problem, students cannot solve the problem if they do not understand the problem; 2) planning, experienced students will be more creative in planning problem-solving strategies; 3) solve the problem according to plan; and 4) evaluating, students draw conclusions and re-examine the solution [4]. Understanding the problem can be done by reading the problem through the keywords that are found and writing what is known and what is asked, planning can be done by modeling the problem into a mathematical form or formulating a concept that will be used to solve the problem, solving the problem according to the plan can be done by implementing a plan has been compiled with mathematical concepts and continues to find a solution, and evaluating can be done by confirming the solution of the existing problem to conclude [18]. So that problem-solving skills in learning mathematics are significant competencies, wherein solving these problems students are required to be more creative in expressing and using knowledge (understanding) in solving mathematical problems [19]. Based on this, students generally assume that math problems in the form of story problems are mathematical problems that are difficult to solve [20], especially on geometry [21]. Therefore, the student's success factor in solving problems is influenced by several things, one of which is the level of student difficulty, the difficulties faced by two students in working on the same question may be different but with these difficulties, students get the opportunity to improve their abilities [22]. Based on this, the researcher wanted to find out the students' problem-solving abilities in solving geometric problems.

2. Methods
This research is a qualitative descriptive study conducted at SMP N 1 Piyungan Bantul in class VIII E and VIII F as many as 6 students on flat geometry material. The sample was selected based on the consideration of the researcher and the mathematics teacher in the research class. The research instrument in the form of a written test of problem-solving abilities on flat geometry. The problem-solving ability test consists of 3 essay questions. Also, researchers conducted in-depth interviews with research subjects. Researchers used triangulation methods to determine the validity of the data and the
extent to which students understood the material. The problem-solving ability test instrument was validated by three UNS Surakarta lecturers. The validation results show that the test instrument used in collecting the research data is valid.

3. Results and Discussion

3.1 Result

The researcher gave a description test of three questions to measure students’ problem-solving abilities according to the problem-solving ability indicators, namely understanding problems, planning strategies to solve problems, implementing strategies to solve problems, and drawing conclusions. Each question is used to measure all four indicators. The essay test questions were given to students in the form of geometry material questions. Based on the test results, students were categorized into three categories of problem-solving abilities, namely high, medium, and low. After being given the test, students were carried out in-depth interviews to find out the extent of students’ understanding of the geometry material and the difficulties faced by students in working on these questions. Interviews were conducted with six students based on the results of the tests they took. The results of the tests and interviews were used by researchers to see how students’ problem-solving abilities were based on indicators of problem-solving abilities. The following table shows the indicator scores for the six students.

| Numb | Student Initials | Indicators | Total | Category |
|------|------------------|------------|-------|----------|
|      |                  | Understanding problems | Planning strategies to solve problems | Implementing strategies to solve problems | Drawing conclusions |       |
| 1    | SED              | 0          | 7     | 6        | 5         | 18     | Medium |
| 2    | IIN              | 0          | 3     | 3        | 2         | 8      | Low    |
| 3    | ZN               | 0          | 5     | 5        | 0         | 10     | Low    |
| 4    | INA              | 9          | 7     | 7        | 7         | 30     | High   |
| 5    | F                | 7          | 3     | 3        | 0         | 13     | Medium |
| 6    | ML               | 1          | 6     | 6        | 3         | 16     | Medium |
| Total|                  | 17         | 31    | 30       | 17        | 95     |        |
|      | Percentage       | 31.48      | 57.41 | 55.56    | 31.48     |        |        |

The results of Table 3.1.1 show the categorization of 6 students at the level of problem-solving ability based on indicators of problem-solving abilities. In addition, the table shows the percentage for each indicator. The results showed that one student was categorized as having high problem-solving abilities, three students were categorized as having moderate problem-solving abilities, and two students were categorized as having low problem-solving abilities. Then, for the percentage of indicators of understanding the problem as much as 31.48%, planning strategies to solve problems as much as 57.41%, implementing strategies to solve problems as much as 55.56%, and drawing conclusions as much as 31.48%.

Problems:

1. Ari will make a garbage collection tool out of metal plates. The following picture is the prism-shaped garbage collection tool that Ari wants.

![Garbage Collection Tool](image)

If the metal plate costs Rp 140,000.00 every m2, how much did Ari cost to make the tool?
2. The following figure is the roof of Ibu Dini's house in the form of a pyramid with a plinth size of 12 m × 12 m and a top height of 8 m.

Ibu Dini will install tiles on the roof of her house, every 1 m\(^2\) requires 7 tiles. If the price of a tile is Rp.4,500.00, determine the costs incurred by Early Mother for buying tiles!

3. A garden in the form of a rectangle measuring 160 meters long and 50 meters wide. A moat of the same width is built along the edge of the garden. If the area of the garden is now 3/4 of the original plantation area, can we determine the width of the trench that was built? Tell!

3.1.1 Analysis of the first subject's answer
Category: High

Interview transcript with the first subject.
Q : "What information do you get from question number 2?"
S1 : "Problem number two, it is known that the length of the side of the roof of the house is 12 m and the height of the vertical side is 8 m. Every 1 m\(^2\) requires 7 tiles and the price of each tile is Rp. 4,500.00. Then what is asked is the costs incurred to buy tiles."
Q : "How did you solve the problem?"
S1 : "Initially looking for the surface area of the roof of the house or the area of four vertical sides with a base of 12 m and a height of 8 m. After that, find the number of tiles needed by multiplying the result with 7 tiles. Then find the amount of cost by multiplying the number of tiles required by 4,500 so that the result is Rp. 6,048,000.00."
Q : "Why 8 m is the height of the upright side?"
S1 : "Because the peak height means the peak height to the base length is 12 m, Ma'am."
Q : "Then for questions number 1 and 3 what information did you get?"
S1 : "For problem number 1, we know the base and height of the triangle, the height of the prism, the price of the metal plate every m\(^2\). Then what is asked is the costs incurred to make the garbage
collector. If question number 3 knows the length and width of the garden and a ditch with the same width will be built. Then what is asked is how wide the trench is if the area of the garden after the trench is made becomes 3/4 of the original garden area.”

Q : "How are the solutions for the two questions?"

S1 : "Problem number 1 is looking for the surface area of the shape by finding 2 times the area of the triangle and finding 2 areas of a rectangle with different widths. After that, it is multiplied by the price of the material, so that you can find the costs that must be spent to make the garbage collector. For problem number 3, make an equation regarding the area of the garden after the trench is made which is equated with the length times the width of the size that has been reduced by the trench. So that the y value is obtained as the width of the trench. There are two values for y, but the one that fulfills is 5. The value of 100 does not meet because the width of the trench is negative."

Q : "Alright. Why did you only write the conclusion in answer number 3? Why didn't you make any conclusions about questions 1 and 2?"

S1 : "Because the one I answered last is already the answer, so it doesn't seem a problem not to write a conclusion."

Based on the results of the tests and interviews above, it shows that students can solve questions 1 and 3 correctly, but the indicators for drawing conclusions are not fulfilled because they do not make conclusions. This happens because subject 1 thinks the last answer is his conclusion so he is hesitant or not confident when making a conclusion. Then for question number 2, subject 1 has an incorrect understanding of the height of the rooftop. Subject 1 assumes that the peak height is the height of the vertical side. You should find the height of the vertical using the Pythagorean formula. This caused subject 1 to misunderstand the question.

3.1.2 Analysis of the answers to the second, third, and fourth subjects
Category: Medium

Figure 2. Second subject answer. Figure 3. Third subject answer.
Figure 4. Fourth subject answer.

Interview transcript with the second subject.

Q : "What information did you get from questions 1, 2, and 3?"
S2 : "The information that I got from problem number 1 is the height of the prism 28 cm, the height of the triangle 26 cm, and the base of the triangle 10 cm. Then the questioner is asked how much it costs to make a garbage collector, if the metal plate costs Rp. 140,000.00 every m². The information I got from question number 2 is that the side length of the square base is 12 m, the height of the pyramid is 8 m, for every m² it takes 7 tiles, and the price of a tile is Rp. 4,500.00. Then what is asked is the costs incurred to buy tiles. The information I got from question number 3 is the length of the garden is 160 m, the width of the garden is 50 m, the width of the ditch is 50 m, and the area of the garden after the trench is 3/4 of the area of the original garden. Then what is asked is the width of the trench."

Q : "Fine. Why don't you write down all the information first?"
S2 : "Because I am used to writing the answer straight away, Ma'am."

Q : "Now explain how you solve the three questions?"
S2 : "Problem number 1 I look for each surface area, first looking for the area of a rectangle with a length of 28 cm and a width of 26 cm, the result is 728 cm², secondly I look for the area of a rectangle with a length of 28 cm and a width of 10 cm, the result is 280 cm², and the third finding the area of two triangles with a height of 26 cm and a base of 10 cm, the result is 260 cm². The three areas add up to 540 cm² which equals 5.4 m², then multiplied by 140,000 results in 756,000. Problem number 2 I find the height of the triangle first using the Pythagorean formula with a height of 8 m and a base of 6 m so that the hypotenuse or height of the triangle is 10 m. Then find the area of the roof surface or the area of the four sides of the triangle with a height of 10 m and a base of 12 m to obtain 240 m². After that, multiply by 7 to find the number of tiles needed, which is 1,680 tiles. The number of tiles 1.680 multiplied by 4,500 gives 7,560,000. Problem number 3, initially looking for the area of the garden yields 8,000 m². Then find the second garden area, which is 3/4 multiplied by 8,000, the result is 6,000. Then 8,000 minus 6,000 is 2,000 equated with 50 times y so that y is found to be 40 m."

Q : "Are you sure the addition of the three areas in your answer number 1 is correct?"
S2 : "Yes Ma'am, it's correct."
Interview transcript with the third subject.

Q : "Why is the answer to number 3 that the trench is 50 m wide? Then why 8,000 minus 6,000?"
S2 : "Because the problem explained that the width is the same, namely 50 m. Then 8,000 minus 6,000 because the area of the trench means the difference."
Q : "Okay. Then why numbers 1 and 2 you make conclusions, but number 3 you do not conclude the answer?"
S2 : "Because I was in a hurry to gather Ma'am."

Q : "What information do you get from questions 1, 2, and 3?"
S3 : "In question number 1, I get information on the base of the triangle, height of the triangle, height of the prism, and the price of metal every m². Then what is being asked is the cost incurred by Ari. Problem number 2 which is known by the length of the pyramid base is 12 m and the height of the pyramid is 8 m. Then what is asked is the costs incurred. Problem number 3 shows that the rectangular garden is 160 m long and 50 m wide, a ditch with the same width was built, and the area of the garden is now 3/4 of the original garden area. Then what was asked was to determine the width of the trench to be built."
Q : "Is there any information that you haven't written down or mentioned in question number 2? Take another look and explain!"
S3 : "There is still a lack of information Ma'am. Supposedly adding 1 m² requires 7 tiles and the price for each tile is 4,500."
Q : "Why don't you write down?"
S3 : "Because I am not careful in writing, he knows it."
Q : "Fine. Now how do you evaluate the three questions?"
S3 : "Problem number 1 uses the formula for the surface area of the prism, which is 2 times the area of the base plus the opening bracket plus the height of the triangle, the closing bracket is multiplied by 28, so the result is 2,016. Then the cost from 2016 multiplied by 140,000 is 282,240,000. Problem number 2 is searched by the volume formula so that the result is 384 m³. Then divided by 7 tiles obtained 54.85 rounded to 55 tiles and the total cost of 55 tiles multiplied by 4,500 results 247,500. Problem number 3 looks for the area of the garden with 160 times 50 yields 8,000. Then the trench width is obtained from 3/4 multiplied by 8,000 and then divided by 50 to obtain an agreement for the width of 120."
Q : "Does it help addition and multiplication in answer number 1 you are correct?"
S3 : "Should the sum of between 26 and 36 be locked up."
Q : "Then how about the next calculation?"
S3 : "Calculated from the front, Ma'am. 10 plus 62 equals 72, then multiplied by 28 for 2,016."
Q : "For your answer number 2 why use the formula for the volume of the pyramid?"
S3 : "Because of the number of tiles, it means that the calculated pyramid contains the formula for the volume of the pyramid."
Q : "Then for your answer number 3. Why did you divide 6,000 by 50?"
S3 : "Because the width of the trench is the same, which is 50 m."
Q : "Fine. Why after the answer does not answer the conclusion of the answer?"
S3 : "Because I never reported the answer conclusions."

Interview transcript with the fourth subject.

Q : "What information did you get from question number 1?"
S4 : "In problem number 1, we know that the height of the trapezoid is 28 cm, the height of the triangle is 26 cm, and the base of the triangle is 10 cm. The metal plate price is Rp. 140,000.00 every m². Then asked the cost that was incurred by Ari to make the tool."
Q : "Then how to solve the problem?"
S4 : “Finding the area, which is 2 times 1/2 times 26 times 10, then adding 26 times 28 and adding 10 times 28 you get 1,268 cm² which is made m² to be 0.1268 m². After that multiplied by 140,000 results obtained 17,752 as expenses that have to be spent by Ari.”

Q : “Fine. What information do you get from question number 2?”

S4 : "You know that the height of the pyramid is 8 m and the size of the base is 12 m × 12 m. Every 1 m² requires 7 tiles and the price of each tile is Rp. 4,500.00. Asked the cost of all necessary tiles."

Q : "How is the solution to answer that question?"

S4 : “Finding the height of the triangle first, namely the root of 8 squared plus 6 squared gives 10 m. After that, look for the surface area using the formula for the area of a triangle multiplied by 4 because there are 4 sides with the base of triangle 12 and the height of triangle 10, so the result is 240 m². If 1 m² requires 7 tiles, it means that 240 m² requires 7 times 240 the result is 3,080 tiles. Then multiply by 4,500 the result is 13,860,000.”

Q : "For question number 3, what information did you get?"

S4 : "Number 3 is known to be 160 m long and 50 m wide. Asked to determine the width of the built rays."

Q : "What are the steps for the settlement?"

S4 : “Looking for the area of the garden with 160 times 50 yields 8,000. The width is the same, which is 50 m. Then find the area again with 3/4 times 8,000 the result is 6,000. Then find the width, for example, y means 50 times y equals 6,000, the result is y, which is 120 m.”

Q : "You know the information in questions 1 and 2. Why didn't you write this information on your answer sheet?"

S4 : “No, Mom. So I can finish working quickly. I'm afraid of running out of time, Ma'am.”

Q : “Your answer number 1 has a conclusion. Why don't you conclude numbers 2 and 3?"

S4 : "I missed not writing it down, Ma'am."

Based on the results of the tests and interviews above, it shows that subject 2 can only work on question number 2. Subject 2 in question number 1 an error occurs in the calculation of the addition of the three surface areas which causes an error in the results to the end. Subject 2 in question number 3 had an error in understanding the problem regarding the same width of the trench. Subject 2 understands that the width of the trench is the same, so the size is the same as the width of the garden, which is 50 m. Besides, subject 2 was also wrong in making a mathematical model to solve the problem. Subject 3 could not answer all questions correctly. In question number 1, subject 3 an error occurred in the calculation principle between addition and multiplication. Subject 3 performed calculations from the front regardless of the operation. Subject 3 should have calculated the multiplication operation first then calculating the addition operation. In question number 2, subject 3 experienced an error in understanding the concept of pyramid surface area and pyramid volume. Because subject 3 to solve the problem uses the formula for the volume of the pyramid not the surface area of the pyramid. Besides, subject 3 also encountered an error in understanding the comparison of the number of tiles needed for each m². In question number 3, subject 3 has the same error as subject 2. Subject 4 can only do question number 1 correctly. Subject 4 did question number 2 correctly in taking steps to solve the problem. However, subject 4 had an error in the calculation when calculating the number of tiles needed. In question number 3, subject 4 also experienced the same error as subject 2 and subject 3. Subject 2 and subject 4 did not write down the information on the question because they were not familiar with writing it which made them not confident to write down the information. Subjects 1, 2, and 3 also did not write down their conclusions because they were not used to writing them down and were in a hurry to collect them.
3.1.3 Analysis of the answers to the fifth and sixth subjects
Category: Low

Interview transcript with the fifth subject.
Q : "What information did you get from questions 1, 2, and 3?"
S5 : “Number 1 is given the height of the trapezoid, the base of the triangle, the height of the triangle, the price of the metal plate every m². Asked about the costs involved. Number 2 is known that the size of the base is 12 m by 12 m and the height of the pyramid is 8 m. One m² requires 7 tiles. Price every tile 4,500. Asked about the costs incurred. Number 3 is known to be 160 m long and 50 m wide. The same width means 50 m. Asked the width of the trench."
Q : "How are the three questions resolved?"
S5 : “Number 1 looks for the area of a rectangle 28 times 26 the result is 728, the area of rectangle 24 times 28 is 672, and the area of rectangle 10 times 28 is 280. The three areas add up to make 1,680. Then find 2 times the area of the triangle, the result is 240. The results of both 1,680 and 240 add up to 1,920 cm². So that the cost to be spent 1,920 cm² multiplied by 140,000 results in 268,800. Number 2, find the height of the triangle first using memorization if the height of the triangle is 8 and the base is 6, it means the hypotenuse is 10. The hypotenuse is the height of the triangle. After that, look for the surface area of a pyramid without a base, which is 4 times the area of a triangle with a base of 6 and a height of 10, so the result is 120 tiles. Then 120 is divided by 7 because every m² there are 7 tiles the result becomes 17. The result of 17 is multiplied by the price of the tile 4,500 to become the required cost of 76,500. Number 3 looks for the area of the garden with 160 times 50 yields 8,000. Finding the area of 3/4 times 8,000 is 6,000. Then make the equation x times y equal to 6,000 where x is 50 m. The result is 120."
Q : "For your answer number 1 why is 2 times the area of a triangle the result is 24? Then why find the area of the rectangle is 3?"
S5 : "Because the height of the triangle is 24 and the base is 10. The area of the rectangle on the surface of the prism is 3."
Q : “Fine. You know all the information on the three questions. Why don't you write it down? Why don't you write down a summary of the answer either?"
S5 : "Yes, I didn't write it down because I used to do it like that."
Interview transcript with the sixth subject.

Q : "What information did you get from questions 1, 2, and 3?"
S6 : “In number 1 we know that the base of the triangle is 26 cm, the height of the triangle is 10 cm, the length of the rectangle as the surface of the prism base is 28 cm and the width is 26 cm, the length of the rectangle as the surface of the prism is 18 cm high and 10 cm wide, and the metal plate price is 140,000 every m². Then asked for the cost. In number 2 it is known that the base side is 12 m and the height of the pyramid is 8 m. Every 1 m² requires 7 tiles. The price is 4,500 every piece. Asked the cost of everything. In number 3 it is known that the length of the garden is 160 m and the width is 50 m. The same width is 50 m. Asked the width of the trench."

Q : "How are the three questions resolved?"
S6 : “Answer number 1 is looking for 2 times the area of the triangle, the result is 260 cm², then the surface area of the prism base is 728, and the surface area of the prism is 280 cm². After that, you add up the total of 1,268 cm² to make 0.1268 m², so that the cost is 0.1268 times 140,000, the result is 17,752. The answer to number 2 is searched by the formula for the volume of the pyramid, the result is 384 m³. After that divided by 7, the result is 54.85 rounded to 55 tiles. The price for each tile is 4,500, then 55 multiplied by 4,500 is 247,500. Answer number 3 looks for the area of the garden first 160 times 50 the result is 8,000. The area after 3/4 times 8,000 is 6,000. So 50 times y equals 6,000 the result y equals 120."

Q : "Why is question 3 answered using the pyramid volume formula?"
S6 : "Due to the number of tiles the whole use the volume of the pyramid."

Q : "Why didn't you write down what was known, asked, and the conclusion of the answer?"
S6 : "Because I wrote down the questions and didn't copy them. I already understood the scribbled question sheet so I didn't write it down again. Conclusion I am not used to making it."

Based on the results of the tests and interviews above, it shows that subject 5 cannot do all the questions correctly. Subject 5 experienced an error in question number 1 regarding understanding the question. Subject 5 misunderstands the surface area of the shape that must be sought. In question number 2, subject 5 misunderstood the base of the triangle that must be used in the calculation. Subject 5 uses the base of the triangle as large as 6 m, the base of the triangle used should be 12 m. Besides, subject 5 also misunderstood the ratio of the number of tiles needed for each m². The unit used by subject 5 is also wrong, because subject 5 wrote that the unit of measure for the pyramid is cm not m. In question number 3, subject 5 has the same error as subject 2, 3, and 4. Subject 6 can only work on question number 1. Problem number 2, subject 6 has the same error as subject 3. Problem number 3, subject 6 also experienced the same error as subjects 2, 3, 4, and 5.

3.2 Discussion

Based on the results of written test answers and student interviews, it can be seen that there is one student who has high problem management skills, three students who have existing problem management skills, and two students who have low problem management skills. Students who have high problem abilities note that: 1) there is an error in understanding the questions which are in line with other studies that students have difficulty understanding the problem, where students understand that the height of the pyramid peak is a triangle with a vertical side, not a pyramid height [23]; and 2) not the answer conclusions obtained as in other studies which explain that students complete the correct solution but do not interpret the final answer by writing so that students are confident students have difficulty regarding indicators of understanding the problem [23] and draw conclusions.

Students who have moderate problem-solving abilities note that: 1) there is a calculation error which is in line with other studies that students make mathematical models but make improper computations because students are not careful in mathematical procedures [24]; 2) there is an error in the principle of operation like other studies that there is a mistake in addition and multiplication [25] because students are confused about the addition or multiplication first so that students count according to the order from the front, namely addition first; 3) did not write down the information in line with previous research that
students could not use information to solve problems [24] because they lacked confidence and there was an error in understanding the question regarding the sentence "same ditch width", it is assumed that the width of the trench is the same as the width of the garden, which is 50 m which is cause errors in equations or mathematical modeling; 4) there was an error in understanding the concept, whereas previous research explained that conceptual knowledge mostly affects problem solving [26] and this error is in accordance with other research which explains that students have difficulty connecting problem situations with the formulas or concepts that must be used [27], namely the wrong use of the geometric formula for the surface area of a pyramid or the volume of a pyramid because students do not have the confidence to calculate the number of tiles as solid objects what formula should use and students also misunderstand the concept of the ratio of precarious needed if each m² requires 7 tiles; and 5) students do not make conclusions where the cause is the same as other studies which explain because students rush to collect the consequences of not focusing during problem solving [28] and lack of confidence. This causes students with problem-solving abilities to have difficulty understanding indicators of problems, planning strategies, implementing strategies to solve problems, and drawing conclusions.

Students who have low problem-solving abilities note that: 1) do not write down information in line with previous research that students cannot use the information to solve problems [24] because they lack self-confidence and there is an error in understanding the problem regarding the sentence "same trench width" is considered the width of the trench is equal to the width of the garden, which is 50 m which causes errors in making equations or mathematical modeling, as well as misunderstanding the drawings to find the surface area needed to calculate the costs to make a garbage collector; 2) there is a misunderstanding of the concept in line with other research which explains that students have difficulty connecting the problem situation with the formula or concept that must be used so that the concept is not correct [24], namely incorrect use of the geometric formula for the surface area of the pyramid or the volume of the pyramid because students do not believe it. themselves to calculate the number of tiles as solid objects what formula should be used, students also misunderstand the concept of the ratio of precarious needed if each m² requires 7 tiles, and students misunderstand the concept of the base of the triangle that must be used to calculate the vertical side of the pyramid because The student uses the base of a triangle of 6 m instead of 12 m, the length of the base used should be 12 m because the vertical side is an isosceles triangle, not a right triangle, where a misconception occurs [29] because students have not linked relevant concepts and experiences. in solving problems [28]; 3) students do not write down their answers to conclusions like previous studies [23] because students are not used to writing answers to conclusions or it can be said that the student is not confident. This causes students with low problem-solving abilities to experience difficulty in understanding indicators of problems, planning strategies to solve problems, implementing strategies to solve problems, and drawing conclusions. Based on the students' errors, the percentage score for each indicator is calculated, it can be seen that the indicators of understanding the problem are 31.48%, planning strategies to solve problems by 57.41%, implementing strategies to solve problems by 55.56%, and drawing conclusions. by 31.48%.

Various student mistakes are caused by students lack confidence, lack of understanding of problems, weakness in understanding concepts, principles, and mathematical formulas of geometric material, and lack of skills in calculation Therefore it is necessary to provide more and more complex questions so that students are familiar with various kinds of non-routine questions by previous research which explains that the factors that can stimulate student experience in problem-solving are the use of challenging and non-routine mathematical problems [30]. Giving non-routine problems can emphasize students in developing problem-solving skills, reasoning, and the use of other skills in solving daily life problems [29]. Non-routine problems can be applied, for example, by giving open problems [31]. Open problems are problems characterized by students' ignorance of how to solve problems directly and students will hesitate with questions, steps for solving, and calculations to find solutions to the answer [32]. Besides, it is also necessary to have an understanding of mathematical concepts, principles, and formulas so that they do not hurt students in solving advanced material geometry problems.
4. Conclusion

Based on the results of the study, it can be concluded that the students' problem-solving abilities are high, medium, and low. Students with high problem-solving abilities have difficulty understanding indicators and drawing conclusions. Students with moderate and low problem-solving abilities experience difficulty in all indicators, namely understanding problems, planning strategies to solve problems, implementing strategies to solve problems, and drawing conclusions. So that the percentage score for each indicator, it can be seen that the indicator of understanding the problem is 31.48%, planning strategies to solve problems is 57.41%, implementing strategies to solve problems by 55.56%, and drawing conclusions by 31.48%. This is because students lack self-confidence, lack of understanding of problems, weakness in understanding concepts, principles, and mathematical formulas of geometric material, and lack of skills in calculations. Therefore, it is necessary to provide more and more complex questions so that students are familiar with various kinds of non-routine questions. In addition, it is also necessary to have an understanding of mathematical concepts, principles, and formulas regarding the surface area of a flat shape so that it does not have a negative impact on students in solving geometric problems of advanced material.

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