Students Creative Mathematical Thinking Abilities In Triangles and Rectangles

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Abstract. This study aims to description of students' mathematical creative thinking abilities on triangles and rectangles, which involves 4 indicators namely fluency, flexibility, originality and elaboration. The method in this study was a qualitative descriptive study, which was conducted on 31 students at one junior high school in Cipatat sub-District. Data in this study were obtained through tests and interviews. The results of this study concluded that students' mathematical creative thinking ability was divided into three groups, namely a group of high mathematical creative thinking abilities with at least three indocators, a medium group that has exactly three indicators and a lower group that has exactly one indicator. In the four indicators of students' mathematical creative thinking, there is a tendency that the level of flexibility is well mastered.

Keywords: Creative Thinking, Triangles and Rectangles

1 Introduction

Mathematics is one component of subjects in schools that has an important role in education and support in the development of science and technology. [1] Viewed from the point of classification of the field of science, mathematics is included in the exact sciences which requires more creative thinking than memorization. However, it cannot be denied that mathematics is still one of the subjects feared by students because it is considered as an abstract concept and has a high level of difficulty. So as to help students understand abstract concepts, concrete (real) objects as intermediaries so that abstract concepts understood by students can be attached and long-lasting if students find and understand through deeds.

[2] states that mathematics can be used to develop the ability to think systematically, logically, creatively, disciplinely, and effectively in a modern and competitive life. According to Handoko's statement, it can be concluded that the function of learning mathematics, one of which is to develop the ability to think creatively. [3] Creative thinking has become an important goal to function in the developed education system, by developing plans, programs, alternatives, good curricula, contributing specialist teaching methods in the curriculum, and developing creative thinking, challenging their creativity, increasing their motivation to innovate, and implementing teaching methods based on scientific approaches, respecting students' ideas and providing opportunities for innovation and productivity. Mathematical creative thinking ability is an essential mathematical ability that needs to be mastered and developed in students who study mathematics, the ability to solve mathematical problems with more than one solution and students think fluently, flexible, elaborate and have originality in their answers. Creative thinking provides benefits to one's life such as adding new knowledge and creating solutions to

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solve problems, the benefits of creative thinking are very broad, unlimited and cannot be limited so that they are able to find things that are completely new or renewable ideas / concepts. [4] Isaken, Puccio and Treffinger describe that creative thinking emphasizes aspects of fluency, flexibility, originality and elaboration.

Creative thinking in mathematics is a skill that needs to be developed especially in the era of reform and intense life competition. Every individual who optimizes their creative thinking abilities will be able to grow healthy and be able to face challenges, whereas individuals who cannot optimize their creative thinking abilities will become frustrated and not ready to face challenges. Problems faced by a person will become more complex along with the development of age and social environment. Thus, a person needs to have the ability to think critically and creatively. [5] For this reason, humans are required to have the ability to obtain, choose, manage, and act on that information to be utilized in a dynamic, challenging, and full of life competition. These all require us to have the ability to think critically, creatively, logically and systematically.

[5] The importance of learning mathematics in managing students' thinking skills, as well as one of the goals that need to be achieved in learning mathematics is the ability to think mathematical creatively. The ability of the students to think mathematic ceratively can not develop if in the learning process teachers do not actively involve students, because such learning processes will inhibit student creativity and activity. Moreover learning objectives will be achieved if the planning and learning methods used can affect the potential and abilities of students.

Based on the description above, the question in this study is how is the description of students' mathematical creative thinking abilities on triangles and rectangles? Based on these questions, the purpose of this study is to find out the description of students' mathematical creative thinking abilities on triangles and quadrilateral material.

2 Methods

This research is a qualitative descriptive study that aims to obtain a picture of students' mathematical creative thinking abilities on triangles and rectangles material. The research subjects consisted of 31 students. This research variable is the students' mathematical creative thinking ability which consists of four indicators namely fluency, flexibility, originality and elaboration.

3 Result and Discussion

3.1 Result

Data from the research results obtained in the form of student learning outcomes for which the data collection using test instruments in the form of a problem description of 5 questions. describe the ability to think mathematically creative students in solving problems in the material triangle and rectangles in each problem. Test data obtained from the analysis of student answers based on the reference guidelines for scoring mathematical creative thinking abilities. Based on the results of data analysis it turns out that students who have high mathematical creative thinking skills can be characterized by all four indicators with fluency, flexibility, elaboration and originality, which are well fulfilled, the students who have mathematical creative thinking

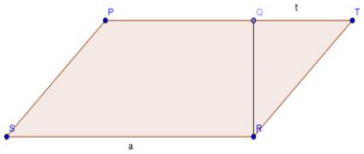
abilities are being characterized by three indicators with fluency, flexibility and elaboration that are well fulfilled, while students who have low ability are characterized by one indicator with flexibility (flexibility) that is well fulfilled. Based on the overall results with four indicators of students' mathematical creative thinking abilities, there is a tendency that the level of flexibility (flexibility) is well mastered, compared to other indicators.

3.2 Discussion

Looking at the analysis of students' answers to all the indicators obtained, the students' mathematical creative thinking abilities on the material triangles and rectangles are divided into three groups, namely groups that have high creative thinking ability by covering more than three indicators that are met, the medium group by covering exactly three indicators who are met and the right low group who has one indicator that is met.

Problem 1

A PTRS parallelogram is formed by a PQRS trapezoid and an isosceles triangle QTR with a right angle at Q. Suppose that PQRS = 4L QTR. Determine all possible sizes on the PQRS trapezoid and the isosceles right triangle QTR. Explain!



Answer :

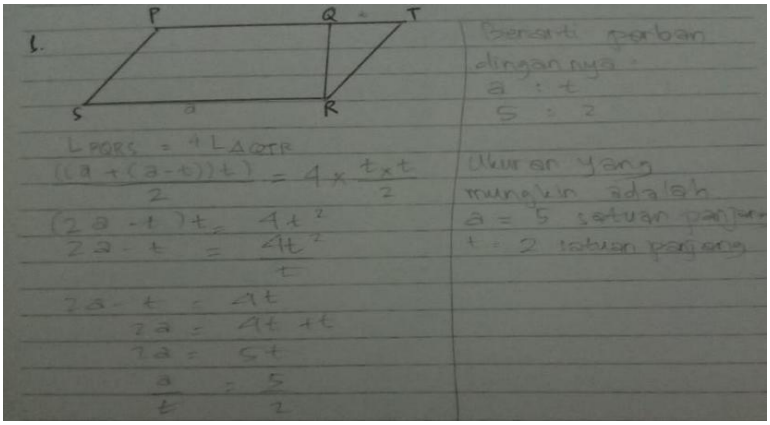


Fig. 1. Student A's Answer.

From the students' answers in **Figure 1**, students answer the questions in detail, but students do not complete the answers as requested in the problem that is asking for several other measures. Moreover based on the results of the interview with some of the students, they can mention other measures and there are also those who mention other measures other than what they wrote, but they say that they were not being careful in reading the questions.

Problem 2

Draw at least 3 different types of triangles that have the same circumference of 12 cm!
Answer :

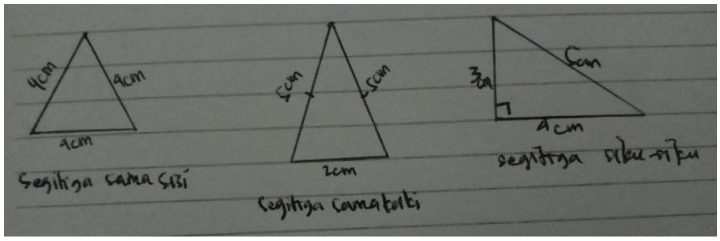


Fig. 2. Student B's Answer.

The students' answers in **Figure 2**, students can drew 3 triangles of different types and can calculate the size of each triangle depicted. The students can solve problems in two or more different ways correctly. Based on the results of interviews with several students, they explained that they had memorized how to calculate the circumference of a triangle.

Problem 3

Rectangular garden with an area of 96 meters.

a. Draw the garden, then explain how to get it!
b. Are there other possible pictures? If there is a picture, show its size!

Answer :

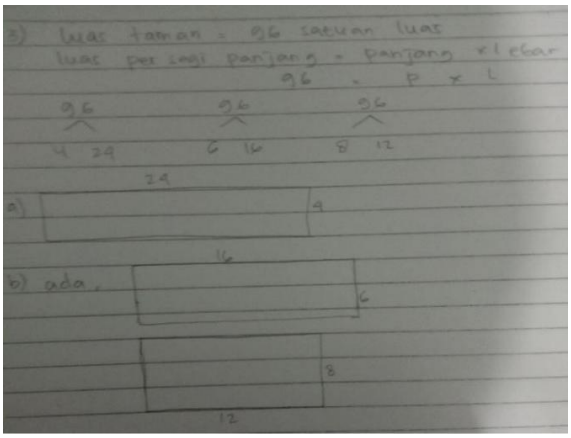


Fig. 3. Student C's answer.

Students' answers in **Figure 3** show that students are only able to answer rectangular garden pictures, they could not find another form with a garden area that was already known. Based on the results of interview with several students said that they also did not find other forms because they did not form an average rectangular or circular garden, but there are some students who can state other shapes and sizes.

Problem 4

Mr. Budi has a rectangular land. The land is divided into three parts which are not as broad. If the width of land owned by Mr. Budi is 100 meters, and the length of the smallest piece of land is 200 meters.

a. Determine the smallest area of land owned by Mr. Budi!
b. Determine the minimum comparison of parts of land owned by Mr. Budi!
c. Can you determine the other total area of Mr. Budi's land?

Answer :

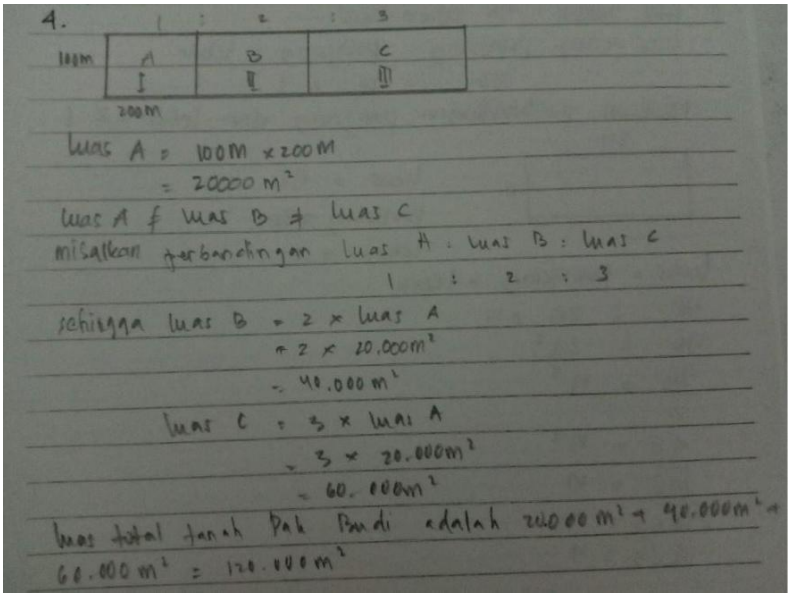


Fig. 4. Student D's answer.

The students' answers in **Figure 4** show students are quite capable of working on the problem, can associate the material of this triangle and rectangular with other material that is comparison. But the students did not complete the answers as requested in the problem that is asking for the total area of other measures. Based on the results of interview with several students, it can be concluded that they were not being careful in reading the questions, desired besides calculating the total area of the size that has been obtained but also on the matter of asking to calculate the total area of the other size.

Research conducted at this time still has many shortcomings and limitations including the follows :

1. Time limitations in research, because it is used in accordance with research purposes only so that researchers can only conduct interviews with a few students.
2. Limited ability. This was realized by the researcher, so with the help of guidance from lecturers it was very helpful in optimizing the results of this study.
3. Material limitations. This research was only carried out in the scope of triangles and rectangles. And it is possible to obtain different results if it is done on other material.

Implementation of the results of this study, because the indicators obtained there is a tendency to the indicators of flexibility (flexibility) which can be mastered well by students, then :

1. There needs to be more research.
2. Basically every student with different mathematical abilities, then it also has the ability to think creatively with the four existing indicators, only the difference in abilities for which the indicator is known.

4 Conclusion

Based on the results of research students' mathematical creative thinking ability of material triangles and rectangles can be concluded as follows:

1. High Mathematical Creative Thinking Ability
   Subjects with high mathematical creative thinking ability have mastered the concepts of triangles and rectangles well. In solving triangular and rectangular problems, the subject gives various answers smoothly and precisely by providing at least three different ways to solve them. The subject also fulfills the four indicators of mathematical creative thinking abilities, namely flexibility, fluency, authenticity and elaboration.
2. Medium Mathematical Creative Thinking Ability
   Subjects with medium mathematical creative thinking ability, master the concept of triangles and rectangles well. In solving problems of triangles and rectangles, the subject gives answers in two different ways of solving. The subject also fulfills the three indicators of mathematical creative thinking abilities namely fluency, flexibility and elaboration.
3. Low Mathematical Creative Thinking Ability
   Subjects with low mathematical creative thinking ability only show one indicator of creative thinking, which is good flexibility, where the subject has not mastered the concept of triangles and rectangles well. In solving problems on several indicators the subject is only fixated on one solution only, so the subject cannot develop various methods of diverse. Only the subject flexibility indicator can provide two different ways of solving.
4. There is a tendency that flexibility indicators are well mastered by students who have high, medium and low mathematical creative thinking abilities.

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