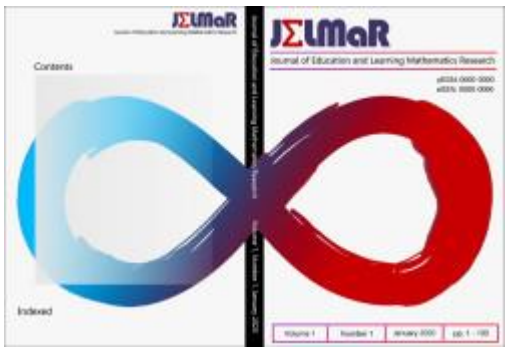

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Junior High School Student's Understanding Mathematics Concepts in Solving Problems of Flat-Sided Three Dimensional

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***Abstract**: Understanding the concept can be seen from the process of solving problems by paying attention to students' abilities. Conceptual understanding in this study is based on students' processes of restating and using concepts that have been learned, using relationships between concepts, and using routine procedures with operations needed to solve math problems. The purpose of this study is to describe the understanding of students' mathematical concepts in solving flat-sided three dimensional problems based on mathematical abilities. This research is a descriptive qualitative research. Collecting data in this study using test and interview methods, the instruments used test sheets and interview guidelines. The research subjects were 3 grade IX students of SMP Negeri 1 Gudo who were selected based on their mathematical ability. Subjects consist of one student who has high mathematical ability, one student who has moderate mathematical ability, and one student who has low mathematical ability. Data analysis was carried out in three stages, namely data reduction, data presentation and conclusion drawing. Based on data analysis, it was found that subjects who had high and moderate abilities restated and used the concepts they had learned, used relationships between concepts, and used routine procedures with operations needed to solve math problems. Subjects who have low mathematical ability restate and use the concepts that have been learned, cannot use the relationship between concepts and cannot solve math problems correctly.*

Keyword: Understanding, Mathematics Concepts, three dimensional

INTRODUCTION

According to Hamalik (2010) the concept is a class or category of objects that have general characteristics. Meanwhile, according to Sudjana (2010) learning concepts, namely the ability to place objects that have the same characteristics into one group. Concepts are expressed in the form of language symbols. Concepts are abstract ideas that can be used to classify a set of objects (Soedjadi, 2000). In mathematics, there are many concepts that students must understand. Understanding is the ability to absorb the meaning of the material or material being studied (Susanto, 2016). Each student has a different understanding ability. In general, indicators of mathematical understanding include recognizing, understanding and applying mathematical concepts, procedures, and ideas (Sumarmo, 2010:4). Understanding also means a person's ability to understand and know correctly about something (Muchyidin and Kartika, 2014). There are three types of understanding, namely changing, giving meaning and making extrapolations. So understanding is the ability to change the problem in the form of a mathematical model, interpret the meaning of the problem and estimate the right way to solve the problem (Ruseffendi in Susanto, 2013).

Mathematics has an important role in learning at school. Mathematics learning in schools aims to (1) understand mathematical concepts; (2) use reasoning on patterns and

traits; (3) solving problems which include the ability to understand problems; (4) communicating ideas; and (5) have an attitude of appreciating the usefulness of mathematics in life (Alam, 2012). So in learning mathematics also aims to understand concepts for students (Prasetyorini, 2013). In addition, the purpose of learning mathematics in high school is to understand mathematical concepts, describe the relationship between concepts and apply concepts or algorithms in solving problems (MoE, 2015). Some indicators of concept understanding according to Rokhayati (2010) include knowing the characteristics of a concept, recognizing some examples and not examples of the concept, recognizing a number of properties and essences, being able to recognize the relationship between concepts, being able to recognize the concept in various situations, being able to use concepts to solve math problems and use relationships between concepts. Indicators of understanding mathematical concepts in this study include: restating and using the concepts that have been learned (drawing known shapes on the problem and using the concept of volumetric shapes), using relationships between concepts, using routine procedures with appropriate operations to solve math problems.

To solve math problems, it is necessary to understand the concept (Muchyidin and Kartika, 2014). Without understanding the concept, students will have difficulty in solving math problems. Students must understand mathematical concepts first in order to be able to solve problems (Murizal et al, 2012). Mathematical abilities can affect students' ability to solve story problems (Isroil, Budayasa and Masriyah, 2017). Geometry is a branch of mathematics that is often poorly understood by students (Nur'aini et al, 2017; Sulestri and Baharuddin, 2019; Susilo et al, 2016).

The results of research from Rismawati and Asnayani (2019) show that the obstacles in mathematics lessons are about simple calculations that connect one concept to another concept. Meanwhile, the results of Pagiling's research (2019) that students' obstacles in solving story problems include: understanding to write down what is known and what is being asked, understanding to write down mathematical models and problem solving skills.

Based on this, the researchers conducted this study to describe the understanding of mathematical concepts for grade IX junior high school students in solving flat-sided three dimensional problems based on high, medium and low mathematical abilities. The results of this study can be used as additional material for teachers to design learning about three dimensions so that students understand better.

METHOD

This research is a descriptive qualitative research. Qualitative research is a research process that is carried out fairly and naturally without any manipulation (Lusiana et al, 2018). This study aims to describe the understanding of mathematical concepts of students of SMP Negeri 1 Gudo class IX in solving flat-sided three dimensional problems based on mathematical ability. This research was conducted in the odd semester of 2019/2020. The subjects in this study were three students consisting of one student with high mathematical ability, one student with moderate mathematical ability and one student with low ability. To determine this subject, the researcher discussed with the grade IX mathematics teacher based on the pure mathematics test scores.

The data collection method in this study used the test and interview methods. The test in this study used a written test. The supporting instruments used are questions about the shape of the flat side space and interview guidelines. Before use, the instrument is validated first. The question given to the subject is one question about finding the time it takes to remove a liquid from a prism-shaped container, so the problem is related to debit and volume. Researchers used time triangulation to determine the validity of the data. Subject

of the question 2 times with a distance of approximately one week. The first and second questions are similar. Subjects were interviewed after each completion of the questions. The data from the interview and the work on the first question will be compared with the data from the interview and the work on the second question. Valid data is then analyzed. To analyze the data, the researcher did it based on the stages of data reduction, data presentation and drawing conclusions.

RESULT AND DISCUSSION

The following is a mathematical problem about the shape of a flat side space used in this study:

A kerosene storage tank has a base in the form of a rhombus with diagonal lengths of 4 meters and 3 meters, while the height of the tank is 2.5 meters. At the bottom of the tank there is a faucet that can drain an average of 75 liters of kerosene every minute. How long will it take to drain the kerosene from the tank until it runs out?

Understanding the concept of high math ability student

The following are the results of the work (answers) of students with high math abilities (S1) :

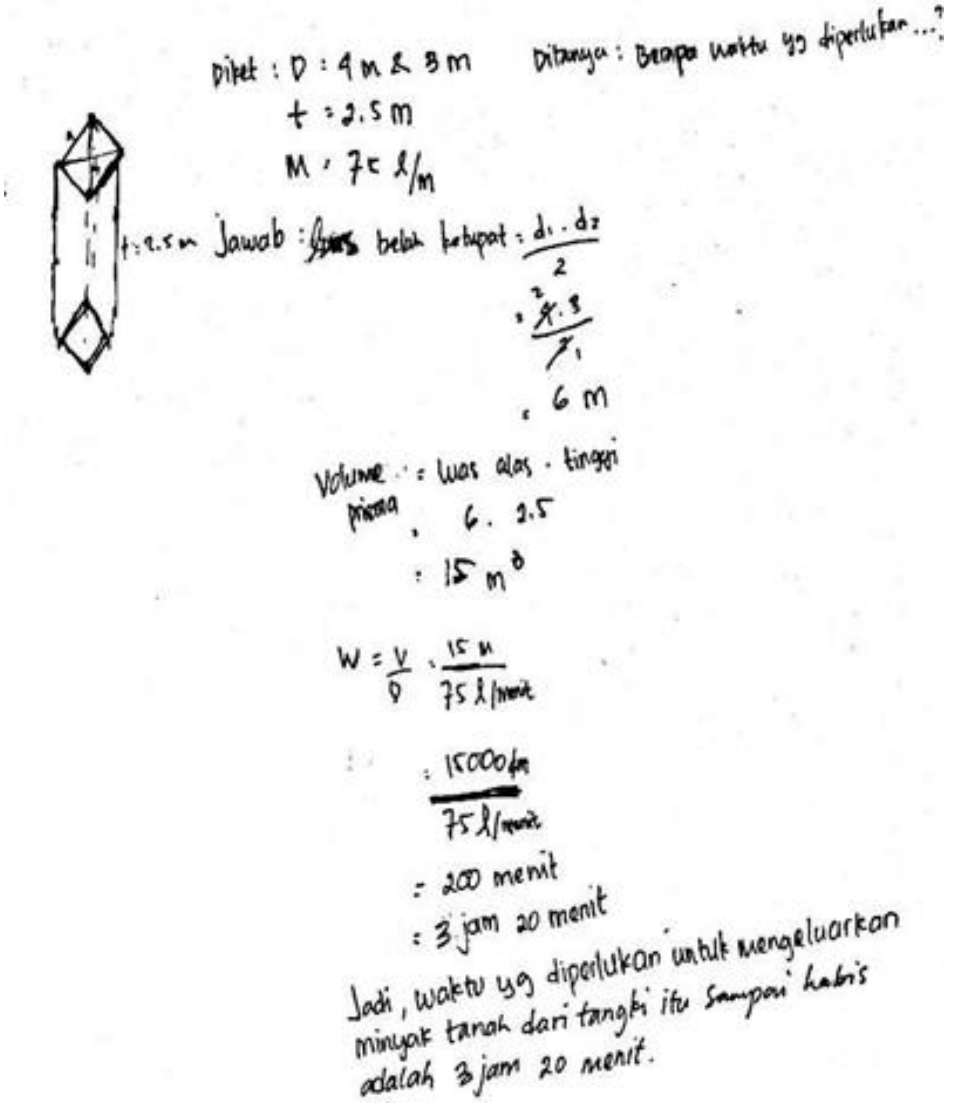

Figure 1. Answers of Students with High Mathematics Ability

The following are the results of interviews with S1:

P : Do you understand and understand the meaning of the question?
S1 : Understood (speaks slowly)
P : It's a bit harsh, can you explain the shape of the flat side space what have you made?
S1 : Yes, this is a picture of a prism with a split base
the rhombus.
P : State the characteristics of the flat-side three dimensional that you have for!
S1 : The base is a rhombus, the sum of the angles is four, eh the sum of the angles is eight, the sides are 4
P : How do you solve this problem?
S1 : I look for the area of the base first and then find the volume of the prism then to find the time it takes I use the discharge formula (while pointing to the answer that has been written).
P : How do you find the volume of a prism?
S1 : How to find the volume of a prism, I first find the area of a rhombus
First, after finding the area of the rhombus times the height of the prism.
P : How do you change the unit from 15 m^3 to 15000 dm^3 ?
S1 : Because it goes down by one and to the power of 3, so 15 times 1000 equals 15000.
P : Why did you change from 15 m^3 to 15000 dm^3 ?
S1 : Because 15000 dm3 is equal to 15000 liters and what is known
on the problem of using liters.

Based on written work and interviews with S1 subjects, it was found that Based on the results of the mathematical concept understanding test, it appears that S1 understands the problem by describing the shape of the space that will be used to solve the problem, S1 explains in full that the shape of the space is a prism with a rhombic base with the characteristics – the characteristic of the base is rhombus, the number of angles is 8, the upright side is 4. This shows that S1 fulfills the indicator describing the shape of the space known in the problem. S1 explains how to find the volume of a prism by multiplying the area of the base by the height. This shows that S1 fulfills the indicator using the concept of prism volume, so that the indicator restates and uses the concept that has been learned is fulfilled. S1 changes the unit from m^3 to dm^3 on the grounds that it is the same as liter, which is known in the problem using liters, and this is used to find the discharge. This shows that S1 meets the indicators using the relationship between concepts. In solving the S1 questions using routine procedures by writing down what is known and asked, calculating the volume of the prism, calculating time using the discharge formula to solve the problem and using commonly used operations (multiplication and division) in solving the problem. This shows that S1 meets the indicators using routine procedures with the operations needed to solve math problems.

Understanding the concept of students with moderate mathematical ability

The following are the results of the work (answers) of students with moderate mathematical ability (S2)

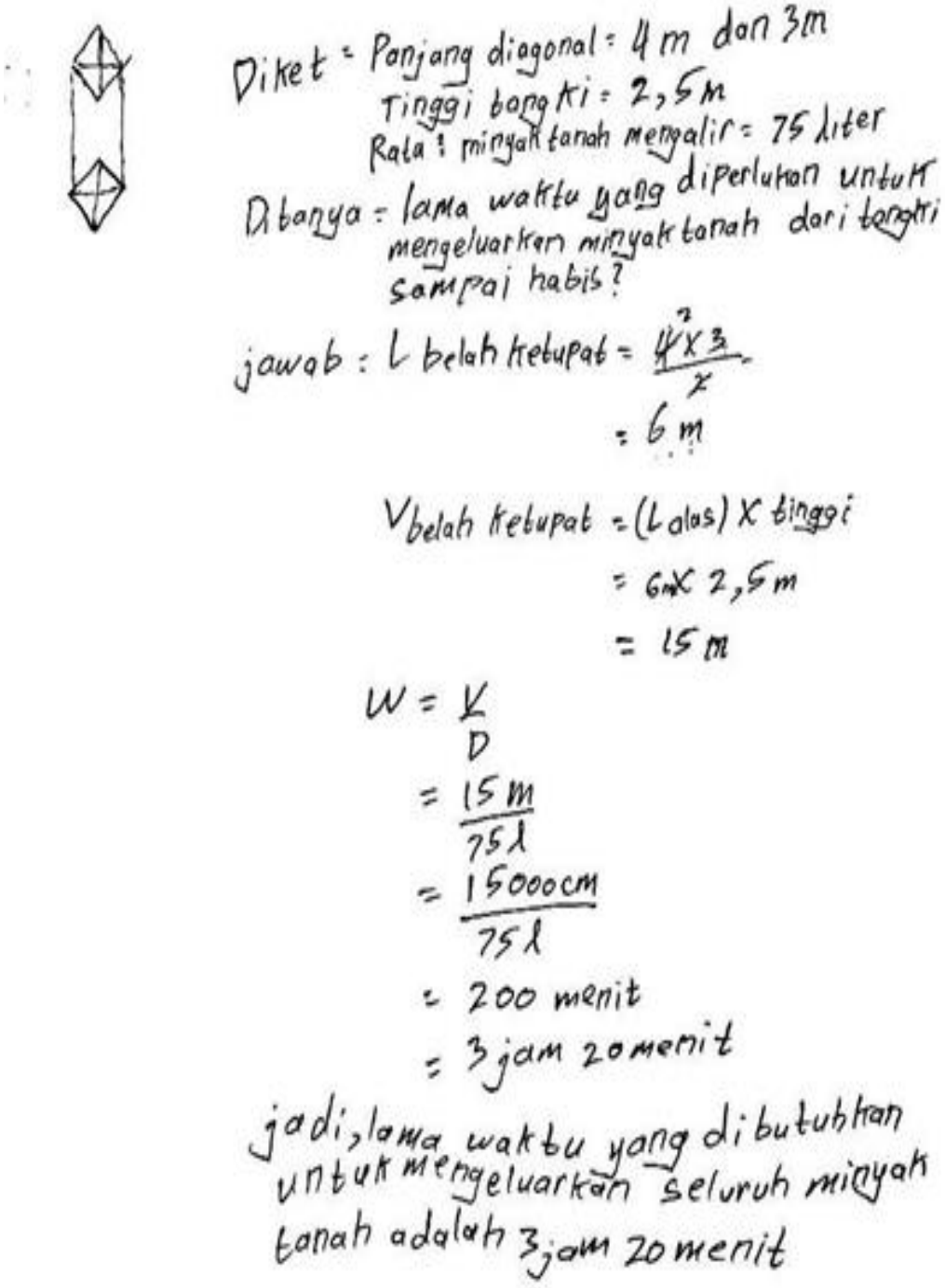

Figure 2. Answers of Students with Medium Mathematics Ability

The following are the results of interviews with S2:

P : Do you understand and understand the meaning of this question?

S2 : Understand

P : So can you explain the shape of the flat side space that has been you make?

S2 : Yes, this is a rectangular prism, uh no, a rhombic prism.
P : Mention the characteristics of the flat side space that you have made!
S2 : There are 8 angles and 4 sides of the rectangle.
P : How do you solve this problem?
S2 : em…I calculated the volume of the prism first and then to calculate the time I used this formula (while pointing to the answer on the paper) em..the debit formula.
P : How do you calculate the volume of a prism?
S2 : Calculate the area of the rhombus first and then multiply the height of the prism.
P : How do I change the unit from 15 m^3 to 15000 dm^3 ?
S2 : Yes, this is down by one and the power is 3, so 15 times 1000, you get 15000.
P : Why did you change from15 m^3 to 15000 dm^3 ?
S2 : So that it can be calculated in the problem, it is liters and 15000 dm^3 is the same as 15000 liter.

Based on written work and interviews with the subject, it was found that Based on the results of the mathematical concept understanding test, it appears that S2 understands the problem by describing the shape of the space that will be used to solve the problem, S2 explains that the image made is a rhombic prism, but the subject did not fully explain the characteristics of the prism. S2 do not state the base of a rhombus-shaped space, only mention the number of angles is 8, there are 4 sides of the rectangle. This shows that S2 fulfills the indicator describing the shape of the space that is known in the problem. S2 explains how to find the volume of a prism by multiplying the area of the base by the height. This shows that S2 fulfills the indicator using the concept of prism volume, so that the indicator restates and uses the concept that has been learned is fulfilled. S2 changed the unit from m^3 to dm^3 but produced the correct result. Finally, at the time of the interview, S2 clarified the meaning of changing the unit, so that S2 met the indicators of studying the problem. This shows that S2 meets the indicators using routine procedures with the operations needed to solve math problems.

Concept understanding of students with low math ability

The following are the results of the work (answers) of students with low math abilities (S3) :

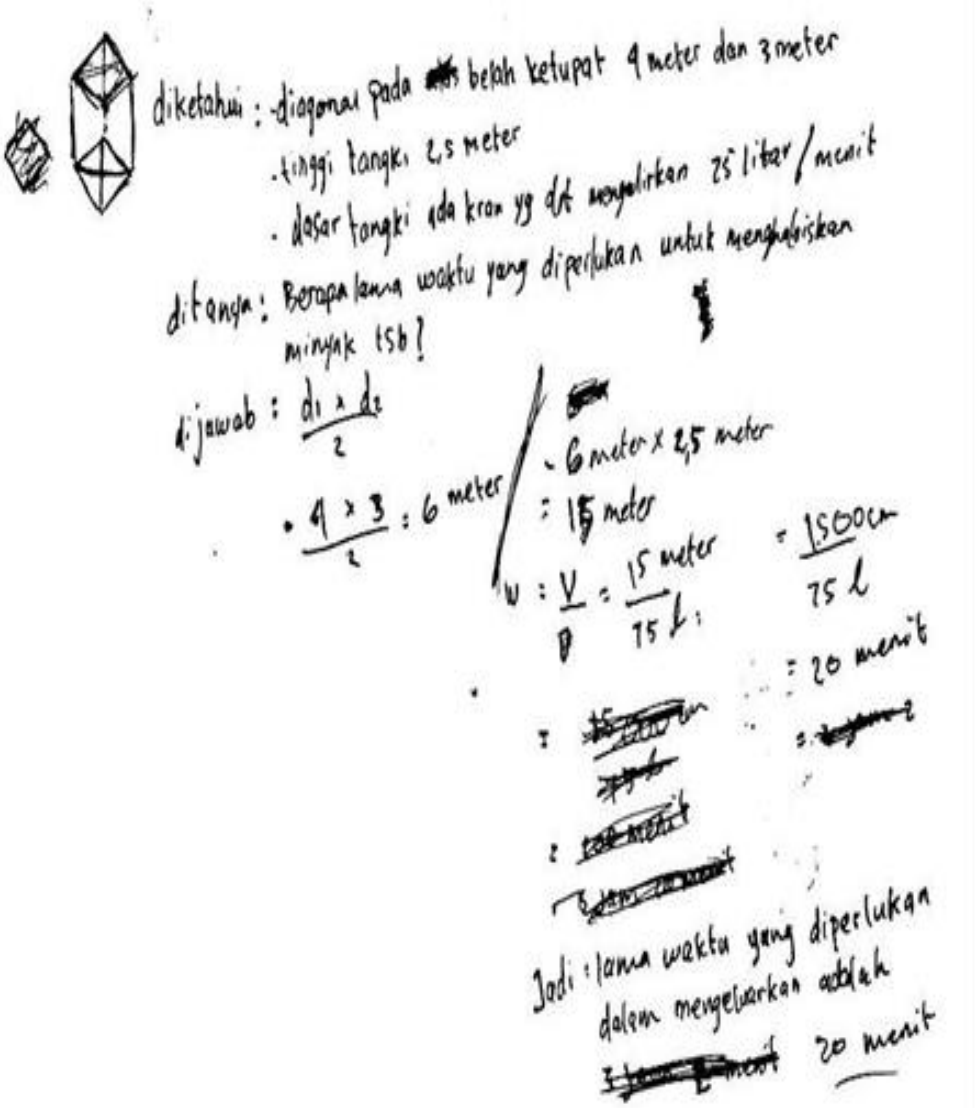

Figure 3. Answers of Students with Low Mathematics Ability

The following are the results of interviews with S3:

P : Do you understand and understand the meaning of the question?

S3 : At first I was a little confused but I understand

P : Can you explain the shape of the flat-sided space that has been you make?

S3 : Yes, what I drew is a prism with a rhombic base.

P : Mention the characteristics of the flat side space that you have for!

S3 : A prism has 8 angles, and 4 ... (pause) these sides are upright

P : Explain how you solve this problem!

S3 : First, find the area of the rhombus itself and multiply it by the height prism meets 15 meters. Then find the time using the volume/discharge formula

P : How do you change the units from15 m^3 to 1500 cm^3 ?

S3 : Because down two so equal to 1500 cm.

Based on the results of written work and interviews with the subject, it was obtained that Based on the results of the test of understanding mathematical concepts, it appears that S3 understands the problem by describing the shape of the space that will be used to solve the problem, S3 explains that the shape of the space is a prism with a split base but mentions the characteristics of the shape. prism is incomplete, namely S3 does not state the base of a rhombus, only mentions the number of angles is 8, there are 4 upright sides. This shows that S3 fulfills the indicators describing the shape of the space known in the problem. S3 explains how to find the volume of a prism by multiplying the area of the base by the height. This shows that S3 fulfills the indicators using the prism volume concept, so that the indicators restate and use the concepts that have been learned are fulfilled. S3 does not change the units from m^3 to dm^3 correctly but changes the units from m^3 to cm^3 so that the conversion results obtained are wrong. S3 does not get the correct conversion result, then S3 cannot solve the problem correctly.

Based on the results of the study, students with high and moderate mathematical abilities have the same understanding of concepts in solving flat-sided geometry problems. However, students with low math abilities differ in understanding the concept. the subject is wrong in changing the unit so that the calculation results are also wrong. This is in accordance with the research results of Maulida et al. (2019), subjects with high mathematical abilities better understand concepts in solving problems. The understanding of the concepts of students with high and moderate mathematical abilities in this study is included in the understanding of extrapolation because they have adequate understanding to work on the problem of building a flat side space. This is different from the results of Natalia's research (2020) which only students with high math abilities are included in the category of extrapolated understanding.

CONCLUSION

Based on the results of data analysis, it can be concluded that the understanding of mathematical concepts of students who have high mathematical abilities is the same as students who have moderate mathematical abilities. Both subjects describe the shape of the space that is known in the problem, students use the concept of prism volume. Students use the relationship concept of debit and unit conversion. In solving the problem students use routine procedures and the operations used to solve the problem are correct. Understanding of mathematical concepts of students who have low mathematical ability in solving math problems. Students describe the shape of the space that is known in the problem, students use the concept of prism volume. Students cannot use the relationship between debit concepts and unit conversions correctly, so they cannot solve the problem correctly. This research can be continued with research to improve students' understanding, it can be with certain learning methods or certain media.

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