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Investigating Students' Difficulties in Solving Social Arithmetic Problems

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Abstract

Purpose: The objective of this research was to investigate the challenges faced by junior high school students in solving social arithmetic problems. **Methodology:** This study employed a qualitative method with a descriptive research approach. It was conducted at a junior high school in Pekanbaru, specifically with class VII students at Da'wah Pekanbaru Middle School, involving a total of 30 students. The data collection technique used in this research was a written test consisting of 5 descriptive questions. After students completed the questions, their answers were analyzed. When unique responses were found, the researcher conducted interviews for further insights. **Findings:** Based on the research results, students faced difficulties in solving social arithmetic problems due to 1) difficulty in understanding the information from the questions, 2) difficulty in grasping the concepts correctly, 3) lack of accuracy in the solution process, and 4) time constraints, which prevented students from completing the questions properly and correctly. **Significance:** It is hoped that the results of this research will help teachers guide and address the difficulties faced by students, enabling them to develop their abilities in mathematics, especially in social arithmetic.

Keywords: learning difficulties, middle school, social arithmetic.



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Introduction

Mathematics is a science that is indispensable to other scientific disciplines, particularly in the fields of science and technology (Kurniati, 2019). Mathematics is a universal science that forms the foundation of modern technology (Kasri, 2018). Mathematics facilitates logical and rational thinking, thereby indirectly enhancing human cognitive processes (Mytra et al., 2023). Given the importance of mathematics, it is imperative to gain a comprehensive understanding of the subject. Furthermore, mathematics is inextricably linked to numerous aspects of daily life, both conscious and unconscious (Aripin et al., 2019). Mathematics is a science that is taught at every level of education and has numerous benefits in life (Yolanda & Wahyuni, 2020). As posited by Ariawan et al. (2022), mathematics is a crucial and obligatory subject in the realm of education. This is due to the fact that mathematics provides a foundation for a multitude of activities. Mathematical concepts pertaining to everyday life, such as social arithmetic, serve as an illustrative example. The incorporation of mathematical learning within the school curriculum exerts a profound impact on the evolution of students' cognitive processes.

Learning is an effort to improve the quality of education. Mathematics learning as part of the educational process in schools has an important role in increasing students' competence. This is in accordance with the Minister of Education and Culture's regulation Number 21 of 2016 (Minister of Education, 2016) concerning content standards that mathematics subjects at the basic education level are given so that students have the competence to be able to show a logical, critical, analytical, careful, conscientious, responsible attitude and not give up easily in solving problems. The student learning outcomes assessed include attitudes, knowledge and skills (Musfigon & Nurdyansah, 2015). Student learning outcomes are the achievements that students achieve academically through exams and assignments, actively asking and answering questions that support the acquisition of these learning outcomes (Dakhi, 2020). In academic circles, the idea often arises that educational success is not determined by the student's grades stated on the report card or diploma, but the measure of success in the cognitive field can be determined through a student's learning outcomes. The results of research related to PISA show that there are still students with low abilities when testing mathematical literacy skills in several types of content and the same context. This is caused by many factors, including variations in the questions and material chosen (Hawa & Aini, 2014).

In the learning process, it is not uncommon for students to make mistakes when working on questions. In fact, learning outcomes are an urgency that junior high school students must have, especially in solving social arithmetic problems. Because, students' learning outcomes in solving social arithmetic problems provide benefits in everyday life. Mathematics is also inseparable from various activities in everyday life. According to Muslika (2014) social arithmetic is a subject that can be applied in life at home or at work. According to (Paramitha & Yuniarta, 2017) the social arithmetic material which discusses financial calculations in trading. This material tends to involve story questions in each discussion. This means that the delivery of social arithmetic material must be truly understood by students so that they are able and skilled to apply and utilize it in everyday life.

Previous research discussing the difficulties of junior high school students has been carried out. One result is that some students still have difficulty solving word problems, especially those related to geometry. Other research also says that many children, after learning simple parts of mathematics, do not understand much and understand many concepts incorrectly, mathematics is considered a difficult science. Then, according to Sa'idah (2016), learning difficulties can be interpreted as a condition in a learning process which is characterized by the presence of certain obstacles to achieving learning outcomes.

(Amallia & Unaenah, 2018) explained that the problem of learning difficulties is a common problem that occurs in learning activities. Learning difficulties in this case can be interpreted as students' difficulty in receiving or absorbing lessons at school. The research we conducted was different, we also analyzed junior high school difficulties but on social arithmetic material. In reality, there are still many students who have difficulty solving questions on social arithmetic material. The students' difficulties were due to the variety of story forms, making it difficult to understand and translate into mathematical models. Story questions are a form of questions that present problems in everyday life in the form of narratives or stories (Halim & Rasidah, 2019). Apart from that, according to research conducted by (Evijayanti & Khotima, 2016) in Surakarta, it was concluded that the types of difficulties experienced by students in solving social arithmetic story problems were classified into three, namely difficulties in understanding the questions, difficulties in transforming the questions, and difficulties in the solving process. Hence, it can be seen that social arithmetic questions are very difficult if students cannot read and understand story questions. Then, Choirudin (2021) stated that other factors that cause students to have difficulty in working on social arithmetic questions are due to students' low ability and low understanding of arithmetic concepts, lack of attention and seriousness in learning, lack of practice in answering questions, lack of appreciation in reading questions, as well as the inability to analyze story problems.

For this reason, the aim of this research is to determine students' abilities in understanding and solving social arithmetic problems, both in story problems and in the form of calculations. So that after the research is carried out, it will be possible to find out what difficulties students experience in understanding and solving social arithmetic problems.

Method

The method used in this research is a qualitative approach with a descriptive research design. The aim is to analyze students' difficulties in solving problems on social arithmetic material. Qualitative descriptive research means that the data obtained will be collected and presented directly in the form of descriptions of the conditions or atmosphere of the object as a whole, in the form of spoken or written words from people or observed behaviors (Moleong, 2017). In this study, the author selected subjects from class VII students at SMP Da'wah Pekanbaru, with a total of 30 students. The chosen subjects are those who are actively involved in the learning process and have received instruction on the material. Students were given a test on social arithmetic material, designed to diagnose their difficulties in solving mathematical problems related to this topic. This research was conducted on April 29, 2024.

The data collection technique employed in this research is a written test, complemented by supplementary interviews. The instrument utilized in this research employs a series of questions. The written test technique is employed by administering tests to the research subjects, who are students. The test is conducted individually and comprises five descriptive questions pertaining to the subject's ability to solve mathematical problems in the context of social arithmetic.

The data analysis process is carried out by exploring and evaluating the data that has been obtained. This process involves identifying and coding data. In this process, researchers identify and group students' answers based on the students' abilities in working on questions. Firstly, students' answers are grouped into categories of difficulty in answering questions which include low criteria for indicators of identifying relationships between the concepts being studied. Second, students' answers are grouped into categories of difficulty in answering questions which include moderate criteria in the indicator of selecting, using and exploiting procedures or operations that are appropriate to the problem given. Third, students'

answers are grouped into categories of difficulty in answering questions that include high criteria for indicators using models, diagrams and symbols to present a concept. The question indicators used in analyzing social arithmetic questions are:

Table 1. Indicators and questions

No	Indicators	Questions
1	Identify the relationships between the concepts studied.	If the price of 1 kg of oranges is IDR 10,500.00 and the price of 1 kg of mangoes is IDR 15,700.00, then determine the price of 6 kg of oranges and 4 kg of mangoes!
2	Select, use and utilize procedures or operations that are appropriate to the given problem.	An item is purchased for IDR 90,000.00 and sold at a profit of 30%. Determine the selling price of the item!
3	Using models, diagrams, and symbols to present a concept.	A student saves Rp. 250,000.00 in the bank with interest of 1.2% per month. Make a table of these savings then determine the amount of savings for 8 months!
4	Remember and apply formulas routinely in simple calculations.	Every month an employee receives a salary of IDR 1,500,000.00. If he has to pay tax of 6% of the basic salary, is it true that the net salary received by the employee is IDR 1,220,000.00?
5	Linking a concept or principle with another concept or principle.	Mr. Teddy bought a macaw at a price after a 20% discount of IDR 755,000.00. Hence, the price of the macaw before the discount is?

Results and Discussion

Study This use type study descriptive qualitative . Sample in research This are 30 participants educate class VII Da`wah Middle School Pekanbaru with serve question test shaped essay use material arithmetic social . The questions used in this research were 5 questions with a processing time of 45 minutes.

Analysis Answer Students on Question Number 1

From the results data analysis of the problem number 1 is obtained that a number of participant students who are having difficulty in answer questions included criteria low on indicators identify linkages between concepts studied . In this question, some of the students did not understand the concept correctly. The following are the results of some of the students' work when completing the written tests that have been distributed. That is:

1. Jika harga 1 kg jeruk Rp10.500,00 dan harga 1 kg mangga Rp15.700,00 Maka tentukan harga 6 kg jeruk dan 4 kg mangga!

JAWABAN

1 kg jeruk : 10.500,00.
 6 kg jeruk : 63.000,00.
 1 kg mangga : 15.700,00.
 4 kg mangga : 62.800,00.

Figure 1. Students' Answers to Question Number 1

From Figure 1, the students were able to understand the information about the problem, but the students failed to translate it into a mathematical model. Because in the problem there is the sentence "and" which means addition, in line with the extensive history of the development of language and mathematical notation and involving many individuals over time, the word "and" is often used in mathematics to express the addition or combination of two or more numbers or variable. This is because the word "and" describes the process of combining or adding elements together. For example, in a mathematical expression like $3+4$ we use the word "and" to indicate that we add 3 and 4 together to get the result 7. The use of these words has become an integral part of the language and mathematical notation used today. So, the use of the word "and" in mathematics is to describe the addition operation. However, researchers found that students' answers did not add up the word "and" in the question answer sheet, which means that students did not understand the concept of understanding language and notation in mathematics according to indicator question number 1. This error was also in line with Kurniawan and Setiawan (2019) states that one of the mistakes students make when working on story questions is that students do not pay attention to the details in the information and this has an impact on the results of the students' work.

1. Jika harga 1 kg jeruk Rp10.500,00 dan harga 1 kg mangga Rp15.700,00 Maka tentukan harga 6 kg jeruk dan 4 kg mangga!

JAWABAN

$6 \times 10.500,00 = 63.500$
 $4 \times 15.700,00 = 62.800$
 Totalnya = 126.300.

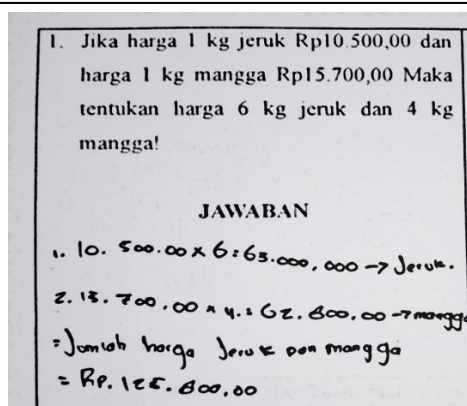
1. Jika harga 1 kg jeruk Rp10.500,00 dan harga 1 kg mangga Rp15.700,00 Maka tentukan harga 6 kg jeruk dan 4 kg mangga!

JAWABAN

1 kg Jeruk : 10.500,00
 6 kg Jeruk : 63.000,00
 1 kg Mangga : 15.700,00
 4 kg Mangga : 28.000,00

Figure 2. Students experienced difficulties

Figure 2 show that students experienced difficulties during the process of working on these questions. Students are able to understand the questions, but students cannot complete addition and multiplication operations correctly. Students often make mistakes because they do not understand the basic rules of arithmetic operations or are trapped in basic conceptual errors. So, students are wrong in determining the final result because students are not careful in carrying out mathematical operations. Because mathematics is a lesson that requires precision and accuracy in every step in solving problems (Halawa & Heksa, 2021).



1. Jika harga 1 kg jeruk Rp10.500,00 dan harga 1 kg mangga Rp15.700,00 Maka tentukan harga 6 kg jeruk dan 4 kg mangga!

JAWABAN

1. $10.500,00 \times 6 = 63.000,00 \rightarrow \text{Jeruk}$

2. $15.700,00 \times 4 = 62.800,00 \rightarrow \text{mangga}$

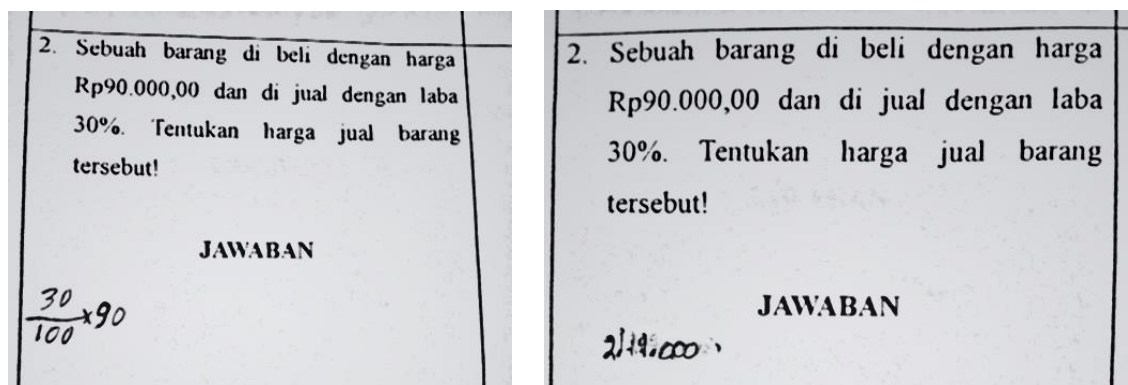
= Jumlah harga jeruk dan mangga
= Rp. 125.800,00

Figure 3. Participant Learn

From Figure 3 shows work on one participant learn what you can understand and be able finish question with precise and correct in accordance indicators that have been determined that is identify link-ages between concepts studied . Which means students do not make mistakes like the students' answers in Figure 3. its show that students already understand the concept of understanding language and notation in mathematics according to the indicators in question number 1.

Analysis Answer Students on Question Number 2

From the results data analysis of the problem number 2 is obtained that a number of participant students who are having difficulty in answer questions included criteria is on the indicator choose , use and utilize procedure or appropriate operation with given problem . In this question, some of the students did not understand the concept correctly. The following are the results of some of the students' work when completing the written tests that have been distributed. That is:



2. Sebuah barang di beli dengan harga Rp90.000,00 dan di jual dengan laba 30%. Tentukan harga jual barang tersebut!

JAWABAN

$\frac{30}{100} \times 90$

2. Sebuah barang di beli dengan harga Rp90.000,00 dan di jual dengan laba 30%. Tentukan harga jual barang tersebut!

JAWABAN

214.000

Figure 4. Students' Answers to Question Number 2

Figure 4 show that students cannot understand the question information so that students cannot solve the questions. According to Rafiah (2020), there are several reasons why students may have difficulty understanding information about mathematics questions, namely difficulties in mathematical concepts, students do not understand the mathematical concepts needed to solve the problem correctly. Lack of language understanding, some math questions require a good understanding of the language used in the problem. Lack of reading skills, many math problems require the ability to read well to understand the context of the problem well. Lack of practice, students may not have enough practice in solving the types

of mathematics problems given so they have difficulty understanding the strategies required. In line with research conducted by (Ardiyanto & Slamet, 2018) it was stated that 54.3% of students were indicated to have experienced errors in determining strategies. This occurred due to several factors, one of which was students' lack of understanding of basic mathematical concepts.

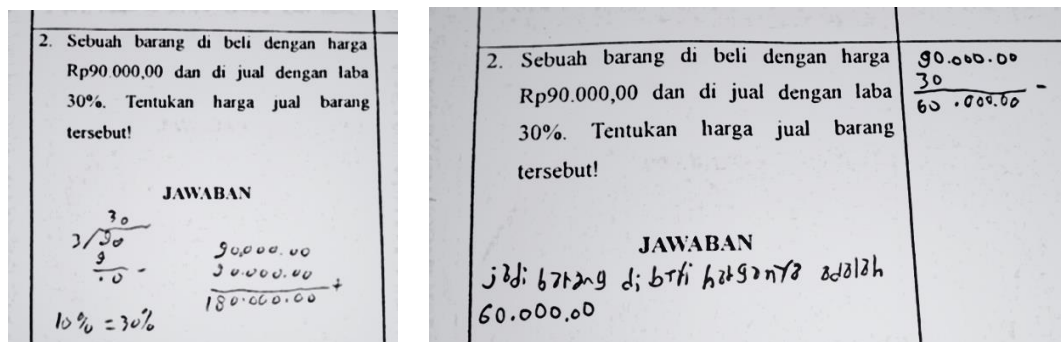


Figure 5. Students Understanding on Question 2

Figure 5 show that students cannot understand the information about the questions, especially the word "profit", so that students are less precise in applying the formula to the questions. Students may not know the word "profit" because it has not been introduced in a context that is relevant to the daily lives of students at the junior high school level. The concept of "profit" may be introduced at higher levels of education. Middle school students do not have enough experience in the context of economics and business to understand the word "profit" well.

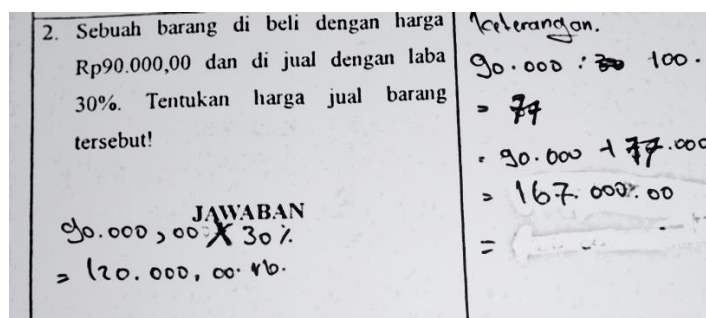


Figure 6. Students Ability

Figure 6 shows that students are able to choose and use the appropriate procedures. However, students have difficulty in multiplication and division operations and have difficulty understanding the problems given in the questions. The same as the student problem in Figure 6, namely that students are able to understand the problem, but students cannot complete multiplication and division operations correctly.

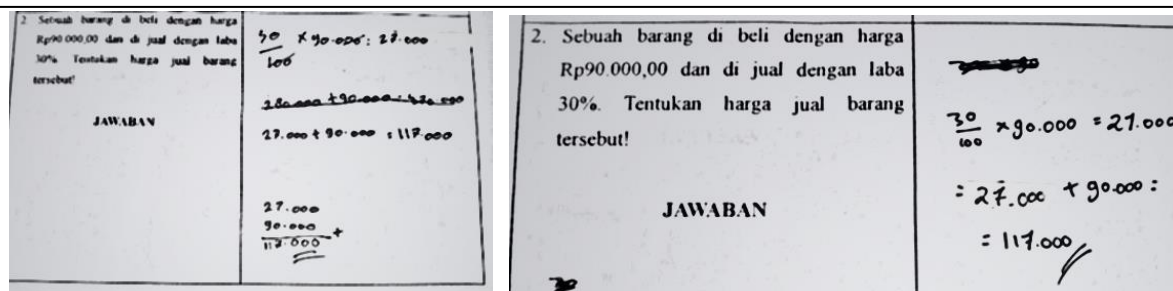


Figure 7. Students Understanding on Question 2

Figure 7 show that students are able to understand and be able to solve problems correctly and correctly according to predetermined indicators, namely selecting, using and exploiting procedures or operations that are appropriate to the problem given. Which means students do not make mistakes like the students' answers in Figures 1 to 5. Students' answers in Figures 6 and 7 show that students already understand how to choose, use and utilize procedures or operations that are appropriate to the problem given.

Analysis Answer Students on Question Number 3

From the results data analysis of the problem number 3 is obtained that a number of participant students who are having difficulty in answer questions included criteria high on the indicator using models, diagrams, and symbols for present something draft . In this question, some of the students did not understand the concept correctly and could not even answer the question at all. The following are the results of some of the students' work when completing the written tests that have been distributed. That is:

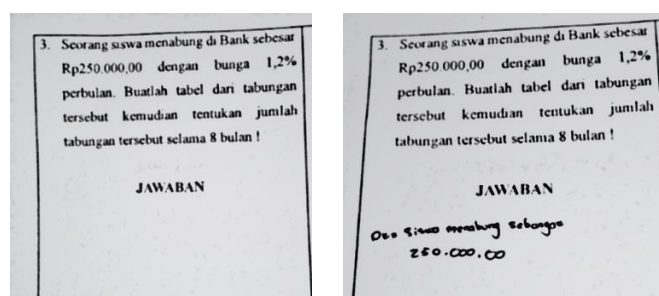


Figure 8. Students' Answers to Question Number 3

From Figure 8 it shows that students cannot understand the information about the questions so that students cannot solve the questions and even students cannot answer the question at all. Students cannot answer questions at all due to lack of knowledge and understanding. If students do not have sufficient knowledge or understanding of the topic discussed in the question they find it difficult to answer. Another factor is lack of motivation. Students do not feel motivated to answer questions because they do not see the importance of the topic or because they do not believe that their answers will not be appreciated.

Figure 9. Students Understanding on Question 3

Figure 9 show that students can understand the question information by making tables, but students have difficulty representing numbers in tables. Students have difficulty representing numbers from story problems in tables due to lack of conceptual understanding. Students do not yet understand the concept of tables and how to use them to represent information from story problems. Another factor is that students' weak interpretation skills are unable to connect the information in the questions with the appropriate table format.

Figure 10. Students Ability on Question 3

Figure 10 show that students can understand and be able to solve questions correctly and accurately according to predetermined indicators, namely using models, diagrams and symbols to present a concept. However, students' answers seemed incomplete due to the limited time we had in conducting research in class.

Analysis Answer Students on Question Number 4

From the results data analysis of the problem number 4 is obtained that a number of participant students who are having difficulty in answer questions included criteria is on the indicator remember and apply formula routine calculations simple. In this question, some of the students did not understand the concept correctly. The following are the results of some of the students' work when completing the written tests that have been distributed.

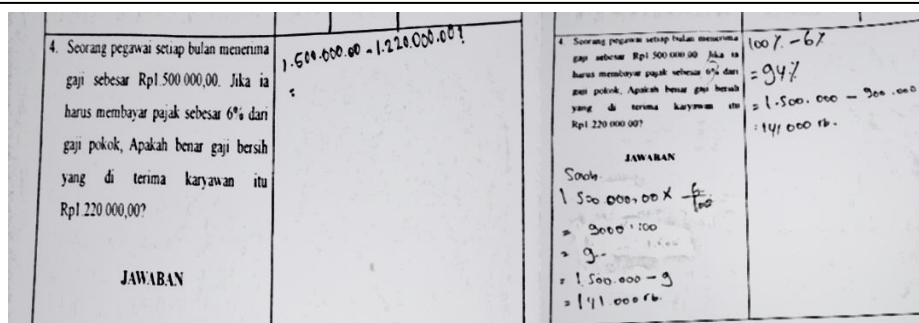


Figure 11. Students' Answers to Question Number 4

Figure 11 show that students cannot understand the information about the questions so that students cannot provide appropriate solutions to the problems given in the questions. Apart from that, students have difficulty digesting what is meant by the questions, this can be seen from the results of students' answers who have not been able to make mathematical models of the questions and students have not been able to apply formulas routinely in simple calculations according to the question indicators number 4.

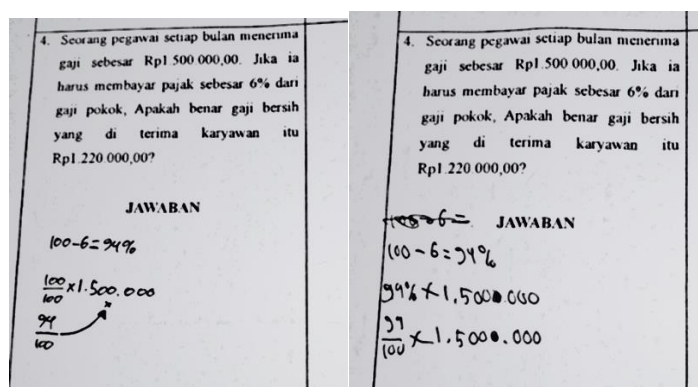


Figure 12. Students Understanding on Question Number 4

Figure 12 show that students can remember and apply formulas, but students do not complete simple calculations, so students do not get the final results. We as researchers suspect that the reason why students are unable to complete the questions to obtain the final result is because of the lack of time that students have so that students are unable to complete the last operation in multiplication.

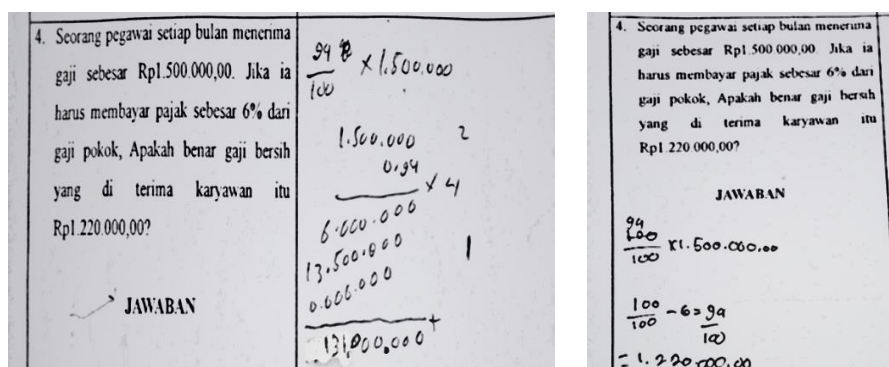


Figure 13. Students Ability on Question Number 4

Figure 13 show that students can remember and apply formulas, and students can complete simple calculations but with incorrect calculations or final answers. The same as the students' problems in Figures 10, 11 and 12, namely that students are able to understand the problem, but students cannot complete addition and multiplication operations correctly.

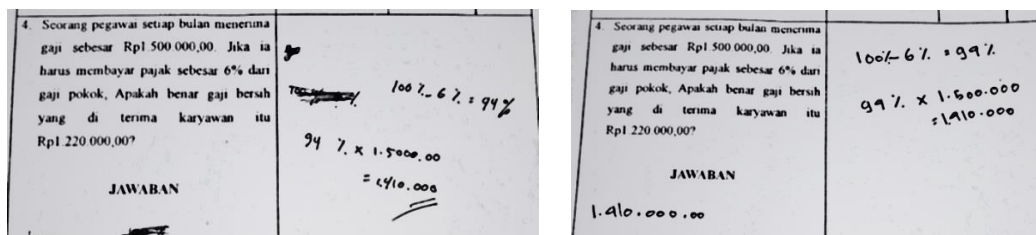


Figure 14. Students Ability on Question Number 4

Figures 14 show that students can understand and be able to solve questions correctly and correctly according to predetermined indicators, namely remembering and applying formulas regularly, simple calculations. Which means students do not make mistakes like the students' answers in Figures 1 to 6. Students' answers in Figures 12 and 13 show that students already understand how to remember and apply formulas routinely in simple calculations.

Analysis Answer Students on Question Number 5

From the results data analysis of the problem number 5 is obtained that a number of participant students who are having difficulty in answer questions included criteria is on the indicator hook something draft or principle with draft or principle other . The following are the results of some of the students' work when completing the written tests that have been distributed.

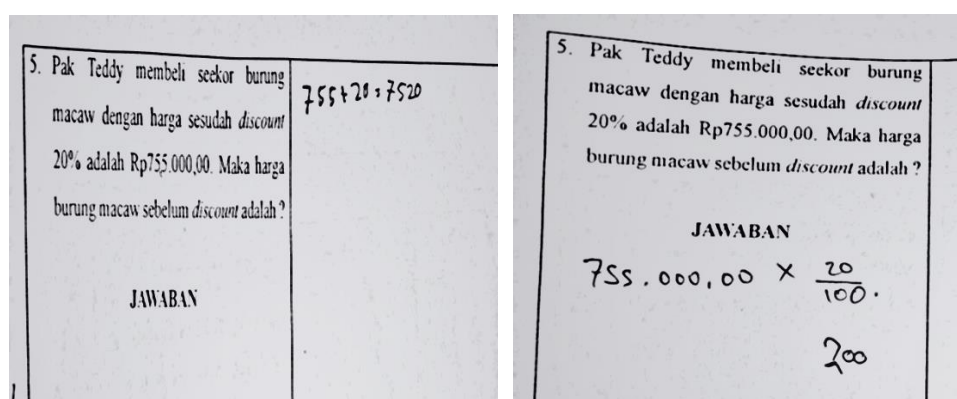


Figure 5. Students' Answers to Question Number 5

Figures 5 show that students cannot understand the question information according to the indicators, namely linking a concept or principle with another concept or principle. so that students cannot solve the questions. Another factor that causes students to not be able to solve questions is due to limited time in solving questions. There are several reasons why working on math problems can take a long time. One of them is the complexity of the problem itself. Some questions require deep understanding, complex problem solving, and careful steps to solve them correctly. Furthermore, some people may need extra

time to understand the underlying mathematical concepts before being able to properly apply them to the problem. The solution to getting used to doing math problems quickly is regular practice, understanding basic concepts, using effective techniques and strategies, increasing calculation speed, working on questions in a limited time and analyzing mistakes.

Analysis of Student Answers as Resource Persons in Interviews

During the data collection process, researchers found several unique answers from students as respondents. Then, the researcher decided to conduct an interview with one of the students as a respondent to be interviewed regarding the answer, as a resource. However, in this research the researcher only interviewed three sources, due to the limited time the sources had.

Researcher : I would like to ask the students here who have answered the practice questions that you gave me earlier regarding social arithmetic, have you experienced any problems in working on the questions?

Interviewee 1 : The problem is difficult, sis

Interviewee 2 : It's safe, Sis, I just don't have enough time, Sis

Interviewee 3 : Yes, sis, there are some difficult questions, sis

Researcher : Approximately what number did you experience difficulty in working on that question?

Interviewee 3 : If you have difficulty with number 3, sis, the answer is too long, sis

Interviewee 2 : Yes, it's taking a long time, there's not enough time to complete 5 questions

Interviewee 1 : Yes, sis, it's the same as number 3, so I'll just skip it

Researcher : How difficult do you think question number 3 is?

Interviewee 2 : Using those tables, bro, is a bit complicated

Interviewee 1 : I don't understand, Sis

Interviewee 3 : Same, Sis

Researcher : Oh, wait a minute, I'll check yours first, okay?

The following answers are used as a reference for researchers when conducting interviews.

3. Seorang siswa menabung di Bank sebesar Rp250.000,00 dengan bunga 1,2% perbulan. Buatlah tabel dari tabungan tersebut kemudian tentukan jumlah tabungan tersebut selama 8 bulan!

JAWABAN

Bulan	Tabungan	Bunga
1	250.000,00	1,2%
2	250.000,00	1,2%
3	250.000,00	1,2%
4	250.000,00	1,2%
5	250.000,00	1,2%
6	250.000,00	1,2%
7	250.000,00	1,2%
8	250.000,00	1,2%
Jumlah	2.000.000,00	9,6%

Figure 2. Students Understanding on Question 5

Researcher : Brother, you have seen the answer, try to explain why you answered like this.

Interviewee 1 : Yes, I made savings for 8 months, bro, according to the question

Researcher : OK, but why are the savings amounts all the same for 8 months, the question explains that

there is 1.2% interest every month, why not add interest?

Interviewee 1 : I don't know how to calculate it, then I read that there was a sentence "the amount of savings is for 8 months" yes, I think the amount of savings is the same for all 8 months, bro.

Researcher : OK, actually for question number 3, there is an additional interest of 1.2% every month, of course the amount of savings will also be different for 8 months.

Interviewee : Oh, I see, bro, I didn't understand what you meant, heheh

From this interview, conclusions can be drawn, the reasons why the interviewee made answers like the picture shown above are:

- Source person read the word "table" so source person make table as form answer.
- The resource person read the words "Savings for 8 months" so the resource person assumed that the table was made to show the amount of savings for 8 months with the same amount of savings for 8 months.

The conclusion from the interview was that students were still low in literacy skills, so students misinterpreted questions which resulted in incorrect answers from students.

Conclusions

From the results of the research that has been carried out, it can be concluded that there are several difficulties experienced by students in solving social arithmetic problems, including: students have difficulty translating problems into mathematical models, students cannot complete addition, multiplication and division operations correctly, unable to understand the information about the questions so that students cannot solve the questions, difficulties in representing numbers in tables, students are still low in literacy skills so that students misinterpret the questions which causes the students' answers to be incorrect.

To overcome students' difficulties in solving arithmetic problems, researchers advise students to practice more questions, ask the teacher if they do not understand the material being explained by the teacher, and foster motivation to learn, especially social arithmetic material. Researchers also hope that teachers can provide learning motivation to students so that they have an interest in learning mathematics, and teachers are also expected to be able to provide practice questions that students can work on, especially on social arithmetic material to increase their understanding.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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