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ANALYSIS OF ERRORS MADE BY MTS STUDENTS IN UNDERSTANDING MATHEMATICAL CONCEPTS BASED ON NOLTING'S THEORY

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ABSTRACT
This study aims to identify the types of errors and factors that cause the students's errors in solving questions about understanding mathematical concepts in the material of social arithmetic based on the Nolting Theory. This research is qualitative descriptive. The data collection techniques used are description tests, observations, and semi-structured interviews. The researchers selected six students as the subjects. The validity of the data used by a triangulation technique, that is, comparing the results of the student's mathematical test with the results of the interview. Based on the results, the researchers revealed the types of mistakes made by the high, medium, and low category subjects are 1) on the type of misread-direction errors students don't read instructions on the subject due to hasty and unaccustomed reading instructions on the subject. 2) On the kind of careless errors students make in carrying out the calculations due to a lack of care, 3) On this type of conceptual error, the student doesn't understand concepts gross, tara, and net because of a lack of learning. 4) On application errors, students are unable to operate concepts related to discount in solving the issue due to an insufficient understanding of the material. 5) On type test-taking errors, pupils don't re-check answers due to being delayed and not accustomed to solving matters systematically, and 6) on type study errors Students don't spend enough time studying the material of Arithmetic Social due to the lack of interest of the student in the material.
Keywords: errors, Nolting, understanding mathematical concept.

ABSTRAK
Tujuan dari penelitian ini adalah untuk mengidentifikasi jenis kesalahan dan faktor-faktor yang menyebabkan kesalahan siswa dalam menyelesaikan soal pemahaman konsep matematika pada materi aritmatika sosial berdasarkan Teori Nolting. Penelitian ini menggunakan metode penelitian kualitatif deskriptif. Teknik pengumpulan data yang digunakan adalah tes deskriptif, observasi, dan wawancara semi-terstruktur. Peneliti memilih enam siswa sebagai subjek penelitian. Validitas data yang digunakan oleh peneliti ditentukan melalui teknik triangulasi, yaitu membandingkan hasil tes matematika siswa dengan hasil wawancara. Berdasarkan hasil analisis, peneliti mengungkapkan jenis kesalahan yang dilakukan oleh subjek kategori tinggi, sedang, dan rendah adalah 1) pada jenis kesalahan misreading-directions, siswa tidak membaca petunjuk pada soal karena terburu-buru dan tidak terbiasa membaca petunjuk soal dengan seksama. 2) Pada jenis kesalahan ceroboh, siswa melakukan kesalahan dalam perhitungan karena kurang hati-hati, 3) Pada jenis kesalahan konseptual, siswa tidak memahami konsep bruto, tara, dan neto karena kurangnya pembelajaran. 4) Pada kesalahan aplikasi, siswa tidak dapat mengoperasikan konsep terkait diskon dalam menyelesaikan masalah karena pemahaman materi yang tidak memadai. 5) Pada jenis kesalahan saat ujian, siswa tidak memeriksa kembali jawaban karena terburu-buru dan tidak terbiasa menyelesaikan soal secara sistematis, dan 6) pada jenis kesalahan belajar, siswa tidak menghabiskan

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cukup waktu untuk mempelajari materi Aritmatika Sosial karena kurangnya minat siswa terhadap materi tersebut.
***Kata kunci**: kesalahan, Nolting, pemahaman konsep matematika.*

Introduction

Education plays a crucial role in the progress of Indonesia, aiming to produce a generation of youth who are capable of competing productively with other nations. Although education is not the only sector that contributes to national advancement, it is certainly one of the primary and most vital components in driving a nation forward (Mardhiyah, 2021). High-quality education helps in shaping individuals who are critical, innovative, and able to solve real-world problems efficiently (Sari & Rahman, 2018). Moreover, education serves as a bridge for economic development, cultural advancement, and technological innovation (Putra et al., 2020).

Mathematics, as one of the core disciplines, is fundamental in fostering systematic and structured thinking processes to solve problems (Ariani, 2020). It provides a foundation for logical reasoning and problem-solving abilities that are essential in various scientific and technological fields (Hidayat & Nisa, 2019). The ability to comprehend mathematical concepts influences students' overall academic performance and their ability to apply mathematical knowledge in daily life (Syahputra, 2021).

One particularly relevant topic in everyday life is social arithmetic. Social arithmetic covers concepts such as discount calculations, taxes, interest, and various other financial transactions, all of which are commonly encountered in daily activities. Thus, a deep understanding of this material is crucial not only for academic purposes but also for equipping students with practical skills that can be easily applied in real-life situations (Aledya, 2019). Studies have shown that students who grasp mathematical concepts effectively tend to perform better in higher-order thinking tasks (Nursanti et al., 2022).

Understanding mathematical concepts refers to students' ability to comprehend abstract ideas and classify mathematical objects or events. With this ability, students can connect the material they have learned with new material. Therefore, if students do not understand a concept well, they will have difficulty understanding subsequent related concepts (Apriyanti, 2021). It is important to develop conceptual understanding skills so that students can be trained to manage problems logically, analyze the situations they face, and solve problems based on the understanding they have learned (Amir & Masnia, 2019). A strong conceptual understanding helps students grasp advanced mathematical topics with greater ease and effectiveness (Insani et al., 2025).

However, despite its importance, many students still face obstacles in understanding the concepts of social arithmetic. Recent studies suggest that errors in understanding social arithmetic often arise because students struggle to connect abstract concepts with their practical applications in real life (Dila & Zanthy, 2020). Mistakes in understanding and solving social arithmetic problems can be attributed

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to various factors, including insufficient conceptual understanding. Common errors that occur among students in this area include procedural errors, conceptual errors, and errors in interpreting the problems (Gulvara et al., 2023). Identifying the types of errors made by students in understanding social arithmetic is essential to improving the quality of mathematics education (Yunia & Zanthy, 2020).

Analyzing the errors made by students when solving problems related to mathematical concept comprehension is necessary to identify the types of mistakes and the reasons behind them. For this study, the researcher will refer to the indicators of conceptual understanding as presented by Kilpatrick. According to Kilpatrick (2018), indicators for assessing conceptual understanding in mathematics include: (1) restating concepts that have been learned, (2) categorizing objects based on mathematical concepts, (3) applying concepts using algorithms, (4) providing examples or non-examples of the concepts studied, (5) representing concepts in various forms, and (6) connecting various mathematical concepts both internally and externally (Yudhanegara, 2020).

Students typically make mistakes in mathematical modeling when attempting to solve difficulties with conceptual knowledge. Because every learner is unique, these mistakes take diverse shapes (Zulfah et al., 2019). These blunders are a reflection of the pupils' limits, which are evident in the way they solve mathematical issues. Deviations or errors in pupils' written results are referred to as math answer errors. It is critical to identify these mistakes at each step of the solution process (Zulyanty, 2019). Since it offers a solid basis for comprehending more complex information and using it in daily life, conceptual understanding is an essential component of studying mathematics (Setiani et al., 2022). Additionally, a solid conceptual grasp improves pupils' capacity to identify problems, reduce calculation errors, and facilitate continuous learning (Harefa et al., 2022). Therefore, conceptual understanding must be a focus in the educational process to ensure that students can develop optimally in the field of mathematics. In addition, understanding and logical reasoning are the reasons why some students find it difficult to grasp concept comprehension.

Various theories and methods can be applied to analyze students' errors, and the choice of method depends on the type of errors to be analyzed. In this study, the method for analyzing students' errors will be based on Nolting's Theory. Dr. Paul Nolting (Nolting, 2015) identified six common types of errors that frequently occur when students solve test problems. The first is Misreading Directions Errors, which occur when students overlook or misunderstand the instructions, leading to errors in answering the questions. The second is Careless Errors, which result from a lack of attention to detail. The third is Concept Errors, which happen when students misunderstand the mathematical concepts or principles needed to solve the problems. The fourth is Application Errors, which occur when students know the formula but fail to apply it correctly to the problem. The fifth is Test test-taking errors, which arise from various factors, such as not completing the answer or not following the procedure to the end. Lastly, Study Errors occur when students study irrelevant or insufficient material. Based on these classifications, Nolting's Theory of error analysis focuses specifically on the examination of concept errors. Evaluating concept errors is crucial to deepening students' understanding of mathematics, as correcting these errors can improve learning outcomes in the

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future. Concept errors frequently encountered by students can create difficulties in solving mathematical problems (Ulpa et al., 2021). In addition, previous research has emphasized the importance of addressing these errors systematically to enhance students' problem-solving abilities (Polya, 2019). Error analysis is also crucial for developing effective instructional strategies that target students' specific learning difficulties (Skemp, 2017). Several studies have been conducted, particularly in the analysis of student problems using the Nolting theory. One study is conducted by Nurmahdiyah and Arliani (2022) that examines the type of problem that arises in the material system of the three linear variables. The results show that the type of problem that students encounter the most frequently is while they are studying instructions. Therefore, the researcher has chosen Nolting's Theory as the framework for analyzing errors in this study.

Based on the previous explanation, this research is titled "Analysis of Errors Made by Madrasah Tsanawiyah Students in Solving Concept Comprehension Problems Based on Nolting's Theory." This study aims to identify and describe the types of errors made by students and the factors influencing those errors. The benefits of this research include helping students become more cautious and avoid repeating common errors, thereby enhancing their learning experience in mathematics.

Research Methods

In this study, the researcher will apply a qualitative research method with a descriptive approach. Sugiyono (2021) stated that qualitative research is more descriptive, where the data obtained are in the form of images or words, without focusing on numbers. This approach allows researchers to gain a deep understanding of students' problem-solving processes and the difficulties they encounter (Creswell, 2018). After being analyzed, the data will be presented in detail to facilitate understanding by others. In this study, the descriptive approach will be applied to describe, explain, and interpret the conditions related to the errors made by students in solving problems related to mathematical concept comprehension (Miles & Huberman, 2020).

In this study, the subjects selected will be six seventh-grade students from MTs Al-Islamiyah. The selection of research subjects was based on the assessment of the answers to the questions provided to the students. Based on the evaluation of the answers, the researcher will categorize the students' scores into three categories: high, medium, and low. Then, the researcher will select two students with the lowest scores from each category (high, medium, and low). The subject selection will use a purposive sampling technique, which allows the selection of participants based on specific criteria relevant to the study's objectives (Etikan et al., 2016). The categorized student scores, as classified, are presented according to Arikunto (2010) as follows in Table 1.

Table 1: Student score criteria

Score	Categorized
$X \geq 81,5$	High
$30 < X < 81,5$	Medium
$X \leq 30$	Low

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The data collection techniques in this study include answers to six essay questions related to the comprehension of mathematical concepts in social arithmetic, as well as interview results to gain deeper insights from the research subjects, particularly to identify the factors contributing to students' errors when solving mathematical concept comprehension problems. The use of multiple data collection methods, including written responses and interviews, helps triangulate findings and improve research reliability (Patton, 2015). The steps of data analysis used in this study include data reduction, data presentation, and conclusion (Sugiyono, 2021). The indicators applied by the researcher to identify and describe the types of errors made by students in solving mathematical concept comprehension problems in social arithmetic, based on Nolting's theory, can be seen in the following Table 2.

Table 2. Indicators of student errors according to Nolting's Theory

No.	Type of Error	Indicators
1.	Misreading Directions Errors	a. The student does not list the given information and the question in the problem. b. The student does not understand the information contained in the problem. c. The student misinterprets the social arithmetic problem.
2.	Careless Errors	a. The student makes careless mistakes while solving the problem (such as writing symbols incorrectly, misplacing units, and being inaccurate in performing arithmetic operations).
3.	Concept Errors	a. The student does not understand the formula/concept of percentage, profit and loss, discount, gross, tare, net, and simple interest needed to solve the problem. b. The student does not understand the properties and concepts of social arithmetic material.
4.	Application Errors	a. The student knows the mathematical formula but is unable to apply it to solve the problem.
5.	Test-Taking Errors	a. The student leaves their answer blank without writing anything. b. The student does not complete the answer. c. The student struggles to conclude the final result. d. The student jumps directly to the final result.
6.	Study Errors	a. The student rarely reviews the lesson at home. b. The student does not practice problems often. c. The student has a poor understanding of social arithmetic material.

Modified from Ulpa et al., 2021

Results and Discussion

In this study, the researcher distributed 6 essay test questions on social arithmetic material to seventh-grade students at MTs Al-Islamiyah. The essay questions given were as follows:

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1. Convert the following fractions into percentages:
   a. $\frac{2}{4}$
   b. $\frac{6}{20}$
2. From the following statements, which indicate profit or loss?
   a. A dozen pencils were purchased for Rp 30,000. These pencils were then sold at Rp 3,000 each.
   b. Rika bought a pair of shoes for Rp 350,000. After wearing them for a month, Rika sold the shoes for Rp 200,000.
   c. Rizal bought a cellphone for Rp 1,000,000. The cellphone was sold for Rp 850,000.
3. Novi bought a wardrobe at store A for Rp 500,000. The wardrobe received a first discount of 5%, followed by a second discount of 20% from the price after the first discount. How much did Novi pay for the wardrobe?
4. What is the net weight of an object with a gross weight of 5 kg and a packaging weight of 1.5 kg?
5. A merchant bought a sack of rice with a net weight of 25 kg. After weighing it together with the sack, the total weight was 25.5 kg. What is the weight of the sack?
6. Mr. Zainul deposited Rp 4,000,000 in a bank. The bank provides an interest rate of 12% per year. What is the interest Mr. Zainul will earn in one year?

The researcher analyzed the errors made by students by examining their answers based on the error indicators according to Nolting's theory (Nolting, 2012). This process involved identifying the types of errors students made for each question. The details of the errors made by students in solving the mathematical concept comprehension problems related to social arithmetic, as analyzed from Nolting's theory, can be seen in Table 3 below.

Table 3. Types of errors made by subjects

Subjek	**Butir Soal**					
	No 1	**No 2**	**No 3**	**No 4**	**No 5**	**No 6**
ST1	-	-	Mi, Ca, Ap	Mi, Te	-	-
ST2	-	Te	-	Ca, Co	Mi, Te	Mi, Ca
SS1	-	Mi, Te, St	Mi, Ca, Co, St	Mi, Co, Te	Mi, Ca, Co, St	Mi, Ca, Co, St
SS2	-	Mi, Te, St	Mi, Ca, Co, St	Mi, Co, Te, St	Mi, Ca, Co, St	Mi, Ca, Co, St
SR1	Ca, Te, St	Mi, Co, Te, St	Mi, Ca, Co, Te, St	Mi, Co, Te, St	Mi, Te	Mi, Te, St
SR2	Te, St	Mi, Co, Te, St	Mi, Ca, Co, Te, St	Mi, Co, Te, St	MI, Te, St	Mi, Te, St

Note:
Mi: Misreading Directions Errors
Ca: Careless Errors
Co: Concept Errors

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Ap: Application Errors
Te: Test-Taking Errors
St: Study Errors
Referring to Table 3, it is shown that the most common types of errors made by students include Misreading Directions Errors and Study Errors. Below is a more detailed discussion of the types of errors made by students in solving mathematical concept comprehension problems based on Nolting's theory.

A. Misreading Directions Errors

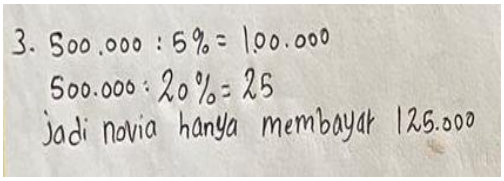

Figure 1. Response of subject SS2 to question No. 3

Referring to Figure 1, it can be said that SS2 was unable to understand the problem in question No. 3 because SS2 did not write down what was known and what was being asked in the problem. SS2 only calculated 5% and 20% of Rp 500,000, resulting in Rp 125,000, and assumed this value as the amount that Novi should pay for the wardrobe, while in fact, this is just the discount value. The following is an excerpt from the interview with SS2:

P : "Do you understand the instructions in question No. 3?"
SS2 : "How much does Novi have to pay for the wardrobe?"
P : "Are you sure about your answer?"
SS2 : "Yes, I'm sure."
P : "Is this the final answer, or just the discount?"
SS2 : "Oh, I think it's just the discount."
P : "Why did you only calculate the discount?"
SS2 : "Hehe, I forgot."
P : "You knew the instructions, but why didn't you know how to solve it?"
SS2 : "Because the instructions are in the problem, but the solution wasn't explained in the question. I didn't know what to do. Hehe."

Based on the interview, it can be concluded that SS2 read the instructions and understood what was being asked in question No. 3, but SS2 did not understand what to do with the instructions; SS2 only understood the command. SS2 failed to write down the known information and the question in the answer sheet due to misunderstanding the procedure, which led to an incorrect solution. The instructions required students to calculate the price after the discount, but SS2 only focused on calculating the discount without moving on to the next step.
Based on the test analysis and interview, several factors affecting Misreading Directions Errors were identified, including:

1. Not reading the question thoroughly.
2. Weak interpretative skills regarding the instructions.

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B. Careless Errors

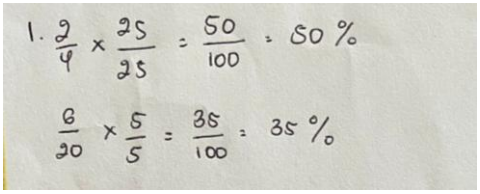

Figure 2. Response of subject SR1 to question No. 1

Referring to Figure 2, it can be said that SR1 was not able to focus on the problem, as SR1 made an error in the calculation for question No. 1. SR1 wrote the final answer for part b as 35%, while the correct answer should have been 30%. In solving the problem, SR1 correctly wrote $\frac{6}{25} \times \frac{5}{5}$ To get the expected result but mistakenly multiplied 6 × 5 as 35 instead of 30. Here is an excerpt from the interview with SR1:

P : "Look at the answer you've written."
SR1 : "Why, Kak? I think the answer is correct."
P : "Why is your answer 35%?"
SR1 : "Oh yes, I see. 6 × 5 is 30, right? Why did I write 35%?"
P : "Next time, be more careful so this doesn't happen again."
SR1 : "Yes, Kak."

Based on the interview, SR1 was confident about the answer written, but did not realize the mistake in the calculation. Upon being asked to review the answer, SR1 acknowledged the mistake. This is a typical careless error caused by a lack of attention to detail while writing the answer.

C. Concept Errors

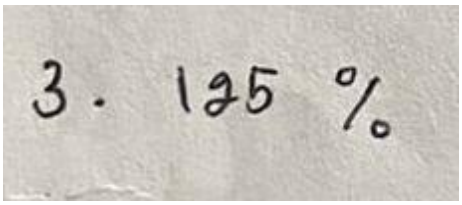

Figure 3. Response of Subject SR1 to question No. 3

Referring to Figure 3, it can be said that SR1 was not able to understand the concept or formula for discounts in solving the problem. This lack of understanding was evident as SR1 did not solve the problem correctly. SR1 was confused about the concept of social arithmetic, particularly in converting the discount result into the correct form (Rupiah). This indicates that SR1 did not fully understand the concept of discount calculation on the price after the discount. SR1 should have calculated the discount amount and subtracted it from the original price to obtain the discounted price in Rupiah, which would be Rp 380,000. Below is an excerpt from the interview with SR1:

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P : "You said that the instruction was to find out how much Novi has to pay for the wardrobe. Should the answer be in Rupiah or percentage?"
SR1 : "Rupiah, Kak."
P : "Then why did you write the answer in percentage?"
SR1 : "Hehe, I don't know, Kak."
P : "What formula or concept did you use to solve question No. 3?"
SR1 : "I don't know, Kak."

Based on the interview results, SR1 did not understand which formula should be used to solve the discount problem, leading to a misunderstanding when solving problems related to discounts. This is evident from the student's answer, which stated the final result in percentage form (125%). When asked why the answer was in percentage, SR1 simply responded that they did not know.

Referring to the test analysis and interview results, several factors were identified that contributed to the conceptual error, namely:

1. Inadequate understanding of the concept.
2. Forgetting the formula.

D. Application Errors

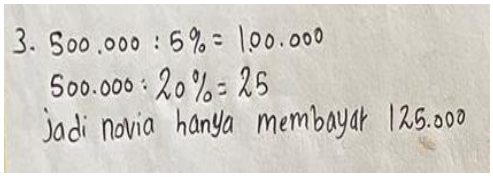

Figure 4. The answer results of Subject Two (ST1) on question No.3

Referring to Figure 4, it can be stated that ST1 made an application error, as ST1 knew the formula or concept to solve Question 3 but was unable to apply it correctly. ST1 stopped after calculating the discount, without continuing to subtract the discount from the original price. This shows that ST1 did not fully apply the mathematical concept. This error indicates that while the student understood how to perform the calculation, they failed to apply the concept correctly in the context of the problem. Below is an excerpt from the interview between the researcher and ST1:

Researcher (P) : "What formula or concept did you use to solve this problem?"
ST1 : "Multiplication and division formulas, Kak."
P : "Is this the result you wrote, the price to pay for the wardrobe, or just the result of the discount?"
ST1 : "Oh, yes, Kak, wrong. It should have been when I got the answer from $\frac{5}{100}\ x\ Rp.500.000$, that's the discount result from 5%. After that, the Rp.500,000 should be reduced by Rp.25,000, Kak, then the answer is Rp.475,000, then we get another 20% discount, so $\frac{20}{100} x\ Rp.475.000$, and the result is Rp.95,000, right, Kak?"

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P	:	"Yes, then what?"
ST1	:	"After that, Rp.475,000 should be reduced by Rp.95,000, right, Kak? So, the final result should be Rp.380,000, right, Kak?"
P	:	"This is correct, so why didn't you write that down on your answer sheet?"
ST1	:	"hehe"

According to the interview results, ST1 was confident in the answer they had written, even though the answer only reflected the discount amount, not the final price the wardrobe should cost. After correctly calculating the first discount (5% of Rp.500,000), ST1 successfully calculated the remaining amount of Rp.475,000. However, ST1 did not write down the second discount calculation correctly on the answer sheet, even though they understood the steps during the interview. After calculating the first discount, ST1 should have recorded the amount of Rp.475,000, then proceeded to correctly calculate the second discount (20% of Rp.475,000 = Rp.95,000) and subtracted it to obtain the final answer of Rp.380,000. These steps should have been clearly written on the answer sheet.
Based on the test analysis and interview results, several factors were found to contribute to the application error, namely:

1. The student only memorized the formula but did not fully understand it.
2. Lack of practice with problems.

E. *Test Talking Errors*

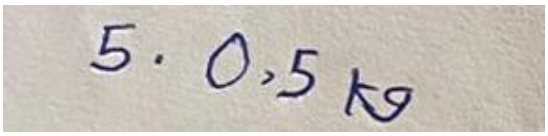

Figure 5. The answer results of low-performing Subject Two (SR2) on question No. 5

Referring to Figure 5, SR2 immediately wrote the final answer without including the steps taken to reach that answer. This is evident from the response, where SR2 only wrote "0.5 kg" as the final answer without any further explanation of the process followed to arrive at that result. Below is an excerpt from the interview between the researcher and SR2:

Researcher (P)	:	"Why didn't you write down the steps for solving the problem?"
SR2	:	"Is that necessary, Kak?"
P	:	"Yes, it is. In the instructions provided, it says 'Every answer must be accompanied by the steps for solving the problem.'"
SR2	:	"hehe"

According to the interview results, SR2 confidently responded with "Sure," indicating that SR2 felt confident with the answer despite not writing down the steps, possibly due to habit or a lack of understanding of the importance of showing the process. The lack of practice that focuses on writing out the steps for solving problems may have led to the habit of only writing down the final answer.

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Based on the test analysis and interview results, several factors were found to contribute to the errors made during the test, including:

1. The student did not double-check their answer.
2. Lack of attention to detail when solving the problem.
3. The student is not accustomed to writing down the steps for solving the problem.

F. Learning Errors

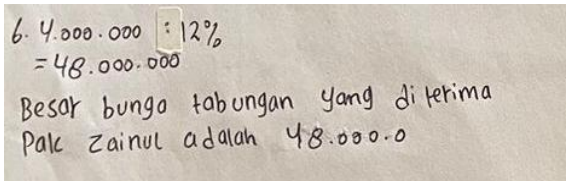

Figure 6. The answer results of medium-performing subject two (SS2) on question No. 6

Interview Excerpt with SS2:

P : "Have you ever spent time reviewing lessons at home, especially social arithmetic material?"
SS2 : "No, Kak."
P : "Do you often practice solving problems at home?"
SS2 : "Not really, Kak."
P : "Do you understand the social arithmetic material?"
SS2 : "A little, Kak."

According to the interview results, SS2 has never reviewed lessons or attempted to practice solving problems at home. The lack of repetition and practice can lead to weaknesses in conceptual understanding, which ultimately affects the student's performance in solving problems. In this case, SS2's failure to review lessons at home suggests that they may not have a strong understanding of the social arithmetic material, particularly concerning interest calculations, which contributed to errors in the calculations and answers. Furthermore, in the learning process, the more frequently lessons are reviewed, the better the retention and internalization of the material.

Based on the analysis of the test and interview results, several factors were identified that contribute to learning errors, namely:

1. The student rarely practices at home.
2. The student rarely reviews lessons at home.
   The student has a limited understanding of the material.

Conclusion and Suggestion

Based on the results of the analysis, the researchers revealed the types of mistakes made by the first hight category subject (ST1), the second high category subject (ST2), the first medium category subject (SS1), the second medium category subject (SS2), the first low category subjevt (SR1), and the second low category subject (SR2) are 1) on the type of misread-direction errors students do not read instructions on the subject due to hasty and unaccustomed reading instructions on

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the subject. 2) On the kind of careless errors students make in carrying out the calculations due to a lack of care, 3) On this type of conceptual error, the student does not understand concepts gross, tara, and net because of a lack of learning. 4) On application errors, students are unable to operate concepts related to discount in solving the issue due to an insufficient understanding of the material. 5) On type test-taking errors, pupils do not re-check answers due to being delayed and not accustomed to solving matters systematically, and 6) on type study errors Students do not spend enough time in studying the material of Arithmetic Social due to the lack of interest of the student in the material.

The researcher recommends the following: (1) Students should be encouraged to be more active in asking and answering questions during the learning process. Additionally, students should be more meticulous when solving mathematical problems, particularly those that require understanding of concepts, to complete them accurately and correctly, without making errors, (2) Teachers are encouraged to explain the material in a simple and student-appropriate manner, ensuring that students understand the content effectively. Moreover, teachers should provide various types of practice problems to help students develop their ability to analyze and solve problems. (3) Future researchers are advised to develop and test educational interventions or teaching strategies designed to reduce the errors made by students.

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