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Analysis of Students' Computational Thinking Skills in Solving Social Arithmetic Problems

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Abstract
This study aims to analyze students' computational thinking skills in solving problems in social arithmetic materials and identify the influence of Prerequisite Mathematical Ability on the achievement of computational thinking aspects. This study uses a qualitative approach with a case study type of research. The research subjects consisted of 31 students of class VIII A who were selected through the purposive sampling technique. The data was analyzed using three main stages, namely data reduction, data presentation, and conclusion drawn. The results showed that students with high KAM were able to meet all computational thinking indicators, especially in questions with low difficulty. Students with KAM are showing good achievement, but still need reinforcement at the abstraction stage to solve problems systematically. Meanwhile, students with low KAM face difficulties in almost all aspects of computational thinking. This research contributes to the approach to mathematics learning to formulate problems, including identifying the initial ability of mathematics and finding solutions in a systematic way.

Keywords: computational *thinking skills*; social arithmetic; case studies

Abstrak
Penelitian ini bertujuan untuk menganalisis kemampuan computational thinking *(CT) siswa dalam menyelesaikan masalah pada materi aritmatika sosial serta mengidentifikasi pengaruh Kemampuan Awal Matematis (KAM) terhadap pencapaian aspek-aspek CT. Penelitian ini menggunakan pendekatan kualitatif dengan jenis penelitian studi kasus. Subjek penelitian terdiri dari 31 siswa kelas VIII A yang dipilih melalui teknik* purposive sampling. *Data dianalisis menggunakan tiga tahapan utama, yaitu reduksi data, penyajian data, dan penarikan kesimpulan. Hasil penelitian menunjukkan siswa dengan KAM tinggi mampu memenuhi semua indikator CT, terutama pada soal dengan tingkat kesulitan rendah. Siswa dengan KAM sedang menunjukkan pencapaian yang baik, tetapi masih memerlukan penguatan pada tahap abstraksi untuk menyelesaikan masalah secara sistematis. Sementara itu, siswa dengan KAM rendah menghadapi kesulitan dalam hampir semua aspek CT. Penelitian ini berkontribusi terhadap pendekatan pembelajaran matematika untuk merumuskan masalah, termasuk identifikasi kemampuan awal matematika dan mencari solusi dengan cara yang sistematis.*

Kata kunci: kemampuan *computational thinking*; aritmatika sosial; studi kasus

Introduction

The characteristics of 21st-century students are creative, independent, collaborative, and critical, so it requires the development of their skills and mindset to be ready to face various existing challenges. The National Education Standards Agency mentions several skills needed to adapt in the 21st century, one of which is computational thinking

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(Trisnowati et al., 2021). In the context of the development of information technology and the current digital era, the ability to do computational thinking has become very relevant, especially in solving mathematical problems. Computational thinking refers to the ability to solve problems systematically by involving processes such as decomposition, pattern recognition, abstraction, and algorithms (Shofiy et al., 2024).

Computational thinking is the main focus, especially in mathematics learning. Mathematics is one of the areas where computational thinking can be applied effectively to improve students' conceptual understanding and problem-solving skills (Juldial & Haryadi, 2024). Using the computational thinking approach, students are invited to see mathematical problems not only as calculation problems but as complex problems that can be solved through systematic thinking strategies. It involves the process of identifying problems, analyzing their components, looking for patterns or relationships, and devising a step-by-step solution. Thus, computational thinking helps students to develop a more structured and logical way of thinking in dealing with various mathematical problems.

Computational thinking is the main focus, especially in mathematics learning. Mathematics is one of the areas where computational thinking can be applied effectively to improve students' conceptual understanding and problem-solving skills (Juldial & Haryadi, 2024). Using the computational thinking approach, students are invited to see mathematical problems not only as calculation problems, but as complex problems that can be solved through systematic thinking strategies. It involves the process of identifying problems, analyzing their components, looking for patterns or relationships, and devising a step-by-step solution. Thus, computational thinking helps students to develop a more structured and logical way of thinking in dealing with various mathematical problems.

Some definitions of computational thinking can be found in the literature. The computational thinking is a thought process that involves systematic and logical problem-solving, similar to the way computers process information (Hidayat et al., 2023). It encompasses a set of skills and methods that allow a person to formulate a problem and its solution so that it can be applied by a computer or other computing agent. Computational thinking is not only important in the field of computer science, but it can also be applied in a variety of disciplines, including mathematics, to help students understand complex concepts and solve problems effectively. Integrating computational thinking in mathematics learning, the students can develop more analytical and methodical thinking skills, which will be especially useful in a variety of academic and everyday contexts, such as in social arithmetic materials.

The integration of computational thinking in social arithmetic learning can help students solve real-life problems logically and systematically. Social arithmetic is one of the important parts of the mathematics curriculum in junior high school, which focuses on the application of arithmetic concepts in everyday life situations (Dewi et al., 2024). Social arithmetic studies the relationship between numbers to solve problems related to everyday life and society with the aim of equipping students with practical skills that they can use in a variety of real-life situations, thereby improving their understanding of how mathematics can be applied outside the classroom. Social arithmetic is a good context for applying computational thinking. Because this material requires students to solve complex real problems in a systematic and logical way. In social arithmetic, students often have to deconstruct a problem into smaller parts (decomposition), recognize patterns in calculations (pattern recognition), filter out important information from a broader situation (abstraction), and follow clear procedural steps (algorithms) to arrive at a solution.

Previous research on the use of computational thinking in mathematics learning shows that computational thinking can improve students' understanding of mathematical concepts

and problem-solving skills (Azmi & Ummah, 2021). Various studies have been conducted to explore how computational thinking can be applied in the context of mathematics learning. The results of the study generally show that the computational thinking approach helps students in developing analytical and logical skills, which are very useful in solving complex mathematical problems (Solehudin et al., 2024).

Facts in the field show that students' computational thinking abilities still need to be considered. This can be seen from the results of an interview conducted by the researcher with Mrs. Yunita, S.Pd., a mathematics teacher at MTsN 2 Mataram, on September 25, 2024. It was found that one of the main challenges in learning social arithmetic is the understanding of the problems given. Mrs. Yunita revealed that in solving math problems, especially when given practice questions using computational thinking skills, such as using problems in the form of applications or story problems, students often have difficulty understanding the instructions and context given. He emphasized that to be able to solve social arithmetic problems correctly, students need to have the ability to identify important information in the problem (abstraction), such as what is known and what is sought (decomposition), as well as systematic steps that must be taken to achieve a solution (algorithmic thinking). However, the student immediately wrote down the formula (pattern recognition) without following systematic steps. This is in accordance with the results of the researcher's initial observation of the computational thinking ability of class VIII A students who have studied social arithmetic material. The following are the test questions and one of the students' answers.

Berikut adalah tabel hasil penjualan buah dari lima orang pedagang di sebuah pasar.

Nama Pedagang	Satuan Penjualan Buah (kg)		
	Apel	Jeruk	Rambutan
A	9	8	8
B	8	8	9
C	9	9	8
D	8	8	8
E	7	9	9

Jika laba per kilogram penjualan apel adalah Rp 7.000,00, jeruk adalah Rp 5.000,00, dan rambutan adalah Rp 6.000,00. Hitunglah pedagang yang mempunyai laba terbesar.

Penyelesaian:

Figure 1
Initial Observation CT Test Questions

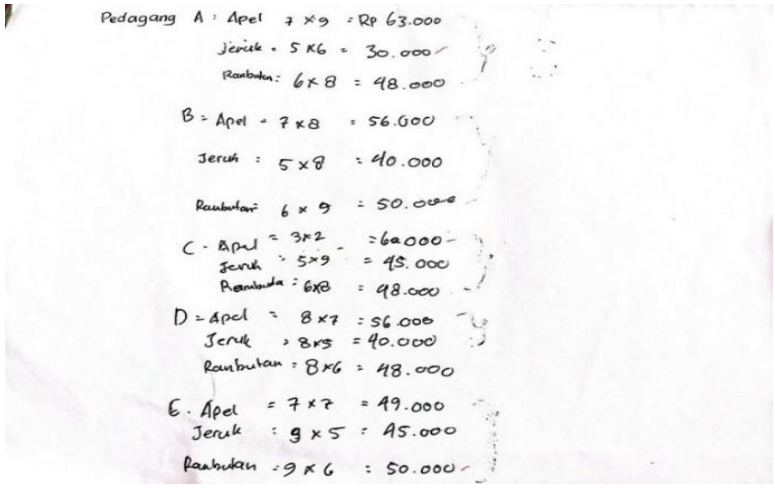

Figure 2
One of the students' answers

Based on the analysis of the students' answers shown in Figure 2, it can be seen that the students consistently multiply the number of fruits per kilogram by the profit per kilogram. However, in trader A who sells citrus fruits, the student multiplies the profit per kilogram of *oranges* by the profit per kilogram of *rambutan*. Supposedly, the unit of sales of citrus fruits per kilogram is multiplied by the profit per kilogram of *oranges*, or 8×Rp 5,000.00. This shows that the student has not been able to simplify the given problem (decomposition stage). In addition, the students did not carry out the process of multiplying the number of fruits per kilogram by the profit per kilogram, then adding up the profits for each trader, and comparing the total profits of each trader to find the largest. As a result, students fail to recognize patterns in the data provided. In the next stage, the student also did not answer the question by adding and comparing the results of the trader who got the greatest profit, so he was unable to carry out the algorithmic thinking process and abstraction correctly. These findings suggest that the ability to computational thinking students are relatively low. This is in line with the findings made by (Mukhibin et al., 2024) that students who have the ability to computational thinking. The low one is only able to meet two indicators. Therefore, research on the ability to computational thinking Students in solving social arithmetic problems become relevant in improving the quality of mathematics learning in schools.

Method

This study uses a qualitative approach with a case study research design. The subject of this study is class VIII A as many as 31 students who were selected through engineering purposive sampling (Lenaini, 2021). The process of selecting the research subject was determined based on the results of the analysis of students' daily test score data on comparative materials, which are prerequisites for social arithmetic, and students' scores were grouped based on the category of Prerequisite Mathematical Ability (e.g., KAM), namely high, medium, and low. After that, the researcher conducted a structured interview (interview guidelines in the form of questions that have been prepared in advance) to students to understand their abilities. In this process, the researcher selects students based on the similarity of answers that can represent the same level of KAM criteria. Students who only write the final answer without the process of working or do not give an answer at all are disqualified from the subject selection process. In-depth interviews with selected subjects to obtain more detailed data related to computational thinking ability in solving mathematical problems. Guidelines for questions about abilities computational thinking students adopted from the Junior High School Mathematics book (As'ari et al., 2017) and thesis by (Marfuah, 2022). The following are examples of guidelines for questions asked to students, namely:

1. At the beginning of the month, Ibu Rina bought the following items to sell in her store:

It	Item Name	Number of Items	Price per Purchase Unit
1	Pencil	15 dozen	Rp.24.000,- per lusin

2	Eraser	10 pack	IDR 47,000,- per dozen (40 pieces)
3	Picture Book	6 dozen	Rp.39,000,- per dozen (10 pieces)

Mrs. Rina then sold the items at the following prices:

It	Item Name	Number of Items	Price per Unit of Sales
1	Pencil	1 piece	IDR 3,500,-
2	Eraser	1 piece	IDR 2,000,-
3	Picture Book	1 piece	IDR 5,000,-

At the end of the month, Mrs. Rina managed to sell all the goods she bought. Calculate the total profit and percentage profit of each item that has been sold by Mrs. Rina!

2. A meatball seller spends a capital of IDR 1,000,000.00 to run his business. He set the price of his meatballs at IDR 13,000.00 per serving. If he plans to get a profit of at least IDR 500,000.00 from his sale, then how much should be made?

Furthermore, the stage of data analysis techniques in this study is adopted from the data analysis procedure from Miles and Huberman's theory involving three main stages, namely data reduction, data presentation, and conclusion drawing (Dwiyono & Tasik, 2021).

Results and Discussion

Result

The researcher analyzed the computational thinking ability based on students' KAM in solving social arithmetic problems. Table 1 below shows the grouping of students by KAM.

Table 1. Criteria of Student Grouping Results based on KAM (Fikriyah, 2022)

Criteria	Categories Assessment	Number of Students
KAM $\geq$ 92,14	High	7
75,34 $<$ KAM $<$ 92,14	Moderate	16
KAM $\leq$ 75,34	Low	8

Based on table 1, the subjects selected are one student each based on the similarity of answers that can represent each criterion.

1. Analysis of computational thinking ability based on High KAM in solving social arithmetic problems:
   a. Data presentation in question 1 of S1 subject

      Based on the results of data collection that has been carried out at MTsN 2 Mataram, the following is presented with an analysis of written tests based on the indicators of computational thinking of students with high ability in solving mathematical problems.

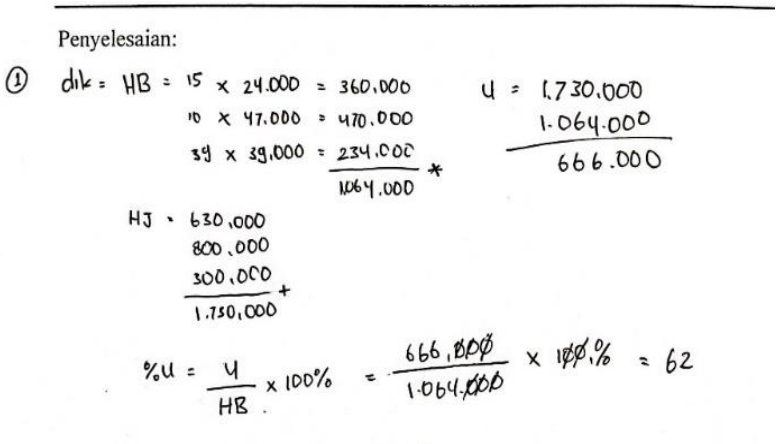

Figure 3
S1 Answer Results

The following is a presentation of data with high KAM ability in solving mathematical problems, namely:

1) Decomposition

Based on the figure, S1 has simplified complex problems into simpler forms. To dig up more in-depth information related to S1 answers, the researcher conducted interviews about the ability to decompose in solving problems. The following are the results of interviews with S1 subjects related to decomposition skills.

P: When you first saw the question, what did you do to make it easier to understand?
S1: First, read the questions. Second, make a table to make calculations easier. Third, simplify the problem to know what needs to be calculated
P: For the second question, can you mention any information that is known from the question?
S1: Price of goods per dozen and price of goods per seed
P: If you are asked about this question, what is it?
S1: Calculating total profits and profit percentages

Based on the S1 interview excerpt above, it is known that S1 is able to understand well the problems given and are able to explain the information requested.

2) Pattern Recognition

The results of the description of S1's answer in working on the problem, show that S1 writes down the selling price and the buying price, so that it can find a pattern to calculate the total profit. The following are the results of interviews with S1 subjects.

P: Can you explain the equation used?
S1: Purchase price = this one this time (while showing the problem of the number of goods multiplied by the price per unit. Then for the selling price, the number of goods sold is the same price per seed. So if you make a profit, the selling price is minus the purchase price. Finally, the percentage of profit (profit/purchase price) is times 100%.

Based on the interview excerpt, S1 can solve the problem by looking for the buying price and selling price so that he gets a total profit of Rp.666,000;- and looking for a percentage of profit.

3) Abstraction

Figure 3 shows that S1 solves the problem by substituting it into the formula mentioned in the pattern recognition stage. However, S1 is wrong in interpreting the question command. On the answer sheet, S1 calculates the overall profit percentage, not the profit percentage for each type of goods. This is in accordance with the results of the interview of S1 subjects.

P: Have you found the right solution to the problem?
S1: Already
P: What conclusions can be drawn based on the steps you have used?
S1: Fortunately that 666,000 is the same as the percentage of profit that is 62

4) Algorithmic Thinking

Based on the results of the description of the answer, it can be seen that S1 is still incomplete in completing the question commands given. In addition, S1 has not found the right solution on the percentage of profit, which resulted in its failure at the algorithm's thinking stage. The following is an excerpt from the S1 interview.

P: Explain the first steps you take in solving the problem.
S1: Read the questions carefully, then take note of important things such as what is known.
P: Why are you taking these steps?
S1: To make the calculation easier

As a result of the interview above, S1 was able to explain what initial steps were known and asked even though it was still wrong in interpreting the question commands given. In addition, S1 is also able to explain the settlement steps well even though it has not found the right solution on the percentage of profit. The following is a table of the results of the analysis of the written test and interview citations.

b. Data presentation in question 2 of S1 subjects

Based on the results of the data collection that has been carried out, the following is presented an analysis of students' written tests in solving mathematical problems.

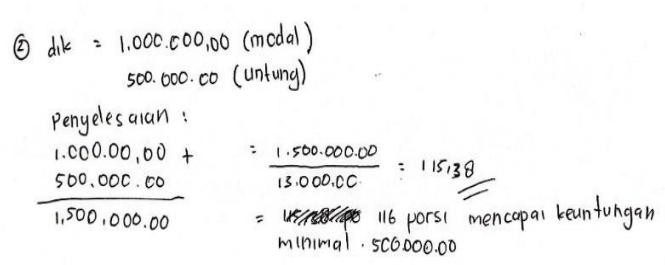

Figure 4
S1 Answer Results

The following is a presentation of Shiva data in solving mathematical problems.

1) Decomposition

Based on figure 4, it can be seen that S1 has written down what is known and simplified complex problems into simpler forms. This is in accordance with the results of interviews that have been conducted with S1.

P: When you first saw the question, what did you do to make it easier to understand?
S1: It's like number 1. I read the questions first, then I simplified the questions to find out the number of portions

P: What information can be mentioned from the question?
S1: Capital spent and selling price per serving of meatballs
P: What is asked of this question?
S1: The number of servings that must be sold to make a certain profit

2) Pattern Recognition

The results of the answer description show that S1 has written down the capital plus the minimum profit and then divided by the price of meatballs per portion. The results of the written test are in line with the results of interviews with S1 subjects.

P: Explain the pattern or rule used in the problem.
S1: Minimum profit plus capital, then the result is divided by the price of meatballs per portion
P: After making the equation, what steps do you take to solve the problem?
S1: Complete the equation to calculate the number of servings of meatballs

3) Abstraction

Figure 4 shows that S1 solves the problem by substituting it into a formula that has been written at the pattern recognition stage so as to find the right solution. This is in accordance with the results of the S1 interview.

P: What conclusions can be drawn based on the steps you have used?
S1: Number of servings to sell = 116 servings

4) Algorithmic Thinking

Based on the results of the description of the answer, it can be seen that S1 has written clear steps in solving the problem. To find out in-depth information related to the steps that have been written, the researcher conducted an interview with S1.

P: Can you explain the first steps you take in solving the problem?
S1: Reading questions, taking notes of known and asked questions
P: Try to explain the steps you have written
S1: First, write the same known as the one asked. Second, write the formula used. Third, calculate

In the interview, it was seen that S1 explained the steps to solve smoothly and was confident that the answer he had made was correct. The following is a table of the results of the analysis of the written test and interview citations.

2. Analysis of computational thinking ability based on KAM in solving social arithmetic problems

a. Data presentation in question 1 of S2 subject

The following is an analysis of written tests based on computational thinking indicators of students with moderate ability in solving mathematical problems.

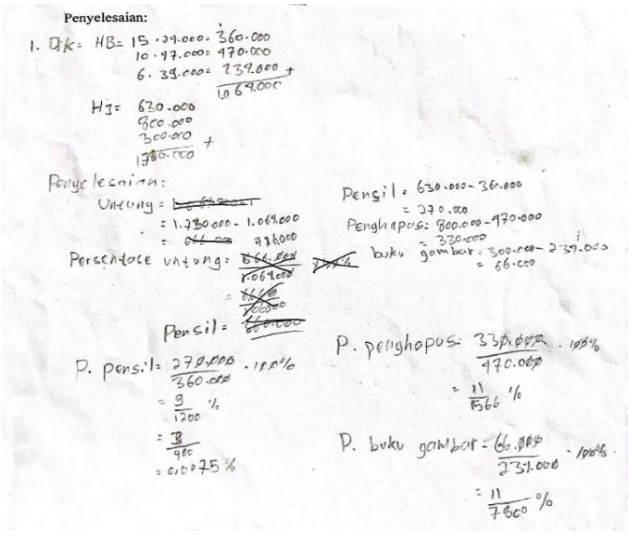

Figure 5
S2 Answer Results

1) Decomposition

Based on Figure 5, it can be seen that the results of the description by S2 in solving the problem show that there is an effort to simplify complex problems into simpler forms. This reflects the ability to decompose, which is the ability to break down problems into smaller, more understandable parts. The following are the results of interviews with S2 subjects.

P: When you first saw the question, what did you do to make it easier to understand?
S2: Make conclusions about what information and questions are in the question
P: Can you mention the same information and what questions are in the question?
Q2: The information in question is the number of goods purchased, the price of the goods purchased is the same as the selling price of each item. If the question is profit is the same as the percentage of profit.
P: Can you explain the problem simply?
S2: Yes, sir. A trader who wants to know the profit and percentage earned if all his trades sell

The interview illustrates that the essence of the problem is a trader who wants to know the profit and profit percentage of his merchandise.

2) Pattern Recognition

Based on the test results obtained, S2 begins the completion by writing down the purchase price and looking for the selling price, but only lists the final result without explaining the calculation process in detail. Next, S2 calculates the total profit by looking for the difference between the selling price and the buying price. In the last stage, S2 calculates the profit percentage of each item by dividing the profit value of each item by its purchase price, then multiplying the result by 100% to obtain the profit percentage. The written test is in accordance with the results of the interview with S2.

P: What kind of cake pattern or equation do you use?
S2: Determine the purchase price, selling price, profit and profit percentage.
P: After making an equation or pattern, what steps do you take to solve the problem?

Q2: Entering numbers into formulas.

3) Abstraction

Figure 5 shows that the S2 subject solves the problem by applying the formula that has been written in the pattern recognition stage. However, S2 made an error in calculating the total selling price, which had an impact on inaccuracies in the calculation of total profit. In addition, S2 is also wrong in calculating the percentage of profit. The mistake occurred because S2 divided the profit of each item by the yield between the purchase price and 100%, even though the step that should have been taken was to divide the profit of each item by the purchase price, then multiply the result by 100%. This is in line with the results of the interview with S2.

P: Can you tell us what solutions you can get based on these problems?
S2: Solutions on the steps to solve the problem
P: So what is the conclusion based on the steps to complete it?
S2: Fortunately, 716,000 is the same percentage profit for pencils 0.0075%, erasers 11/1566%, and drawing books 11/7800%

4) Algorithmic Thinking

Based on the results of the description of the answers given, it can be seen that the S2 subject has taken steps to solve it clearly, even though there are still errors in the process that have been explained at the abstraction stage. The following is an excerpt of an interview conducted with S2.

P: Can you explain the first steps you took?
S2: Understand the problem, determine the profit by the selling price minus the purchase price. After that look for the profit percentage

The interview describes the problem-solving process by S2, which begins with the step of understanding the problem. After that, S2 proceeds by calculating the profit through subtracting the selling price from the purchase price, followed by calculating the profit percentage. In S2's answer, it was found that the calculation of the purchase price was correct, but S2 made a mistake in calculating the total selling price, which caused the profit calculation results to also be inaccurate. Furthermore, although S2 used the correct formula to calculate the profit percentage, errors in its operation were again discovered.

c. Data presentation in question 1 of S2 subject

The following are the results of the written test for S2 subjects

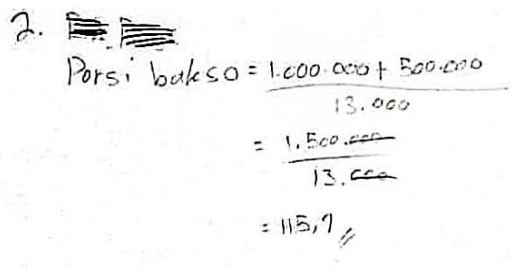

Figure 6
S2 Answer Results

1) Decomposition

The results of the description of the S2 subject in solving the problem show that there is an effort to simplify complex problems into a simpler form. This is in accordance with the results of the S2 interview.

P: When you first saw the question, what did you do to make it easier to understand?
S2: Read the information and questions on the questions
P: Can you mention what information and questions are in the question?
S2: The information is that the capital is one million, the price of meatballs is thirteen thousand, and the same profit is at least five hundred thousand. If the question is how many portions should be made

2) Pattern Recognition

Based on the test results obtained, S2 begins the settlement by writing down the capital plus the minimum profit then the results are divided by the price of meatballs per serving. This shows that S2 has written down the pattern or equation used in solving the problem. The written test is in accordance with the results of the S2 interview.

P: What kind of cake pattern or equation do you use?
S2: Determine the number of meatball portions by adding one million by five hundred thousand, then divided by thirteen thousand.
P: After making an equation or pattern, what steps do you take to solve the problem?
Q2: Calculating the results

3) Abstraction

The results of the written test show that the S2 subject solves the problem by applying the formula that has been written at the pattern recognition stage. This can be seen from the results of interviews with S2.

P: Can you tell us what solutions you can get based on these problems?
S2: Here I have written the steps, after that I get the number of servings of meatballs
P: Then the conclusion?
S2: The total portion of the box is 115.4

4) Algorithmic Thinking

Based on the results of the description of the answers given, it can be seen that the S2 subject has taken the steps to solve it correctly, although there is still a slight mistake in determining the conclusion at the time of the interview. The following is an excerpt of an interview conducted with S2.

P: Can you explain the first steps you took?
S2: Reading questions, discovering what is known and what is asked

The interview describes the problem-solving process by S2, which starts with reading the question, then getting what is known and shown from the question. Furthermore, S2 immediately operates the known information without writing down the formula he uses.

3. Analysis of *Computational Thinking* Ability Based on Low KAM in Solving Social Arithmetic Problems

a. Data presentation in question 1 of S3 subject

The following is presented an analysis of students' written tests in solving mathematical problems.

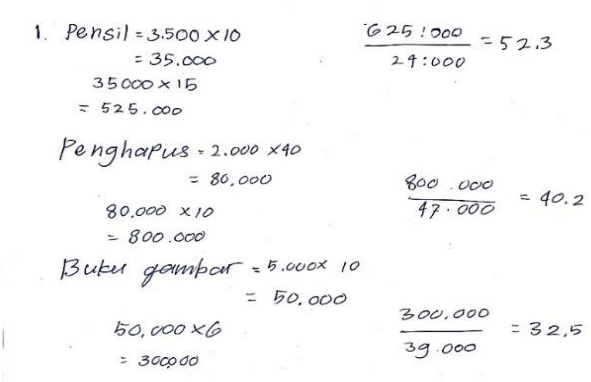

Figure 7
S3 Answer Results

1) Decomposition

Based on Figure 7, it can be seen that the results of the description of the answers given by S3 in solving show an effort to simplify complex problems into a simpler form. However, there are errors in the answers given, especially in the number of pencils per dozen. In general, the number of pencils per dozen is 12, but S3 writes the number as 10. To dig up more in-depth information related to S3 answers, the researcher conducted an interview with S3.

P: When you first saw the question, what did you do to make it easier to understand?

Q3: Read the question first, then I pay attention to what is known and what is asked.

P: Can you tell me what is known about the same question that is asked about it?

Q3: Yes, you can. What is known is that this one is the same as this one (while showing a table of the items bought and sold by Mrs. Rina). If you are asked, calculate the total profit and percentage of profit from each item that has been sold by Mrs. Rina (while reading the question)

Based on the excerpts of interviews with S3 subjects that have been presented above, it is known that S3 shows good ability in understanding the problems given and is able to explain the information requested in a clear and structured manner. This ability shows an understanding of the concept. However, this is in contrast to the results of the written test which shows that there are errors or mistakes in solving the questions. This difference shows that there is a gap between verbal and written skills in solving problems.

2) Pattern Recognition

Based on the results of the test, S3 wrote that the purchase price was calculated as the result of multiplication between the unit price of sales and the number of goods per dozen. However, the calculation is not accurate because the purchase price should be calculated by multiplying the number of goods by the unit price of purchase. Furthermore, for the selling price, S3 calculates it as the result of multiplying the purchase price by the number of goods. However, this method is also inappropriate, because the selling price should be calculated by multiplying the number of goods sold by the unit price of sales. Finally, in determining profits, S3 calculates it by dividing the purchase price by the purchase unit price. In fact, the correct way is to calculate the difference between the selling price and the buying price. The following are the results of interviews with S3 subjects.

P: Do you determine the pattern or equation used in solving the problem?
Q3: I made it up at that time
P: Don't you know the formula for making a profit?
Q3: Well, that's it, I don't know

Based on the results of the interview above, it can be analyzed that S3 faces difficulties in understanding the formula used to solve problems, especially looking for profits. When asked about the pattern or equation used, S3 showed a lack of understanding of the concepts relevant to the problem and even admitted that the answers given earlier were based on mere conjecture. This shows that S3 has obstacles in identifying basic formulas such as formulas to make profits, namely the difference between the selling price and the buying price.

3) Abstraction

The figure shows that the S3 subject solves the problem by substituting into a formula that has been written at the pattern recognition stage. Nevertheless, S3 made mistakes in writing formulas, which ultimately led to failures in the abstraction stage. The results of the interview with S3 subjects are as follows.

P: Have you found the right solution to the problem?
Q3: Already. Pencil 52.3, eraser 40.2, same picture book 32.5

The interview showed that S3 had not been able to find the right solution to the problem given, and the answers submitted were not based on concepts or deep understanding. The inability of S3 to provide relevant solutions can indicate a lack of understanding of the material or problem being discussed.

4) Algorithmic Thinking

Based on the results of the description of the answers given, it can be seen that the S3 subject made a mistake in solving the problem, which resulted in failure at the algorithm thinking stage. These errors indicate that there are obstacles in understanding or implementing the systematic steps necessary to solve the problem. The following is an excerpt of an interview conducted with S31.

P: Can you explain the first steps you took in solving the problem?
Q3: Read the question, pay attention to the same known questions
P: Why are you taking these steps?
Q3: You see, that's what is in my head

The results of the interview show that S3 does not have a structured problem-solving strategy. At first, S3 admitted that the first step was to read the questions, then pay attention to the information that was known and asked. However, S3 revealed that the steps taken were more based on what spontaneously came to mind, without ascertaining whether the steps were relevant or logical.

b. Data presentation in question 1 of S3 subject

The following is presented an analysis of the written test of question 2 with low ability in solving mathematical problems.

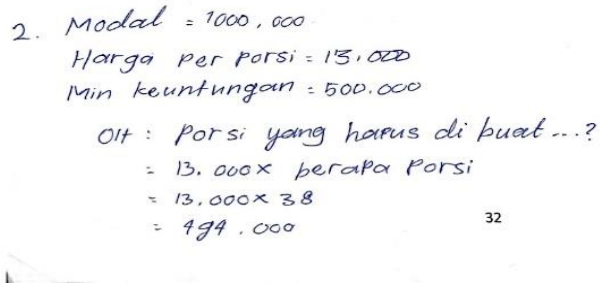

Figure 8
S3 Answer Results

1) Decomposition

Based on the picture, it can be seen that S3 has clearly written down the known information and the questions asked in the question, which is an important first step in understanding the problem. The results of the written test are consistent with the interviews that have been conducted.

P: With the same question. When you first saw this question, what did you do to make it easier to understand?
Q3: Read the question, then I write what is known to be the same as the question
P: Can you mention what is known from this question?
Q3: What is known is that capital = 1,000,000, price per portion = 13,000, same minimum profit = 500,000
P: What is the question asked?
Q3: Servings to make

2) Pattern Recognition

The results of the answer description show that S3 has written a formula in the form of price per portion multiplied by how many portions. However, S3 does not provide an explanation of the purpose of using the formula, so it is not clear what the formula is intended to calculate. The following is the result of the interview with S3.

P: Try to explain the equation you are using.
Q3: I want to find an income from a meatball seller
P: After making the equation, what are the steps to do it?
Q3: First, I compose the formula, after that I calculate

3) Abstraction

The figure presented shows that S3 solves the problem by entering numbers into the formula that has been written, so that the final result of 494,000 is obtained. This is in line with the results of interviews conducted by researchers with S3.

P: Have you found the right solution to solve these problems?
Q3: Already. The income of the meatball seller is 494,000

4) Algorithmic Thinking

Based on the results of the analysis of the answers given, it can be seen that S3 solves the problem briefly, namely multiplying the price per serving by how many portions. However, there is ambiguity in the calculation process, especially regarding the number 38 which appears without explanation of its origin. To find out more about how S3 solves the problem, the researcher conducted an interview with S3.

P: Try to explain the settlement steps you used?

Q3: First, read my sal trus to find the income of a meatball seller by this way of 13,000 times how many portions. After that, I just multiply it
P: Well, the question now is, why did this 38 suddenly appear? Where did you get it from?
Q3: The problem is that the minimum profit is 500,000, so I look for this 13,000 times so that the result is less than 500,000. After I counted what I found, it was 38

Discussion

Based on the results of data analysis on the ability to *computational thinking* students in solving problems on social arithmetic materials, the majority have a moderate level of prerequisite mathematical ability. Students with high mathematical starting ability are able to meet all indicators *computational thinking* in question number 2. However, in question number 1, the subject only met 2 computational thinking indicators, namely decomposition and pattern recognition. S1 is wrong in interpreting the command of a question that causes it to not meet the abstract and algorithmic thinking stage. This is due to the difference in the characteristics of the questions. Question number 1 requires a high level of analysis that requires a deeper understanding. Meanwhile, question number 2 does not involve such an in-depth analysis, so that the subject can solve it more easily. Based on these findings, it can be concluded that S1 has good computational thinking ability, but on questions with the same level of difficulty as question number 2. Similar to the research conducted by Alfina (2017) i.e. the ability *computational thinking* enables students to formulate and solve problems accurately and provide excellent problem-solving solutions. In line with the research conducted by Jamna et al. (2022) that students who have high prerequisite mathematical ability can solve problems.

Students with intermediate mathematical starting ability are showing good achievement in several indicators of computational thinking. In question number 1, students were able to meet two indicators, namely decomposition and pattern recognition, which reflected the ability to identify known and questioned information and find relevant patterns to solve problems. Meanwhile, in question number 2, students managed to meet three indicators of computational thinking, although they were not able to find the right solution at the abstraction stage. This shows that students have good potential in computational thinking, but still need special reinforcement in abstraction ability to eliminate irrelevant information and systematically structure solution steps. This is in line with research conducted by Elinda et al. (2023) Students who have initial mathematical abilities who are currently having problems in solving problems.

Based on the results of the analysis of the ability of S3 subjects who are included in the low category, there is a variation in the achievement of every aspect of computational thinking. In the decomposition aspect, S3 showed a relatively good ability to identify known information and ask questions on some questions, although it was still difficult to simplify the problem to a form that was easier to understand. In the aspect of pattern recognition, S3 has difficulty in identifying relevant patterns and relating them to the mathematical concepts that have been studied, especially in social arithmetic materials, so that they cannot find fundamental relationships to solve problems. In the aspect of abstraction, S3 has not been able to draw conclusions by eliminating irrelevant information and systematically arranging solution steps, which reflects a lack of conceptual understanding. In addition, in the aspect of algorithmic thinking, S3 does not show a structured problem-solving strategy, and the steps made tend to be spontaneous without ensuring relevance or logic (Suripah & Sthephani, 2017). This finding is in line with research conducted by Lestari and Annizar,

which revealed that students in the low ability category are generally only able to record known information from the questions without further analysis (2020).

Limitations

This study proves that students' computational thinking ability is influenced by the prerequisite mathematical ability. This study has limitations, namely the results of the study cannot be generalized to the entire student population, because it is carried out in a selected sample group. Differences in context, such as the learning environment or curriculum, can affect outcomes. Research may not be in-depth enough in analyzing students' computational thinking skills at various levels of difficulty in the questions. Further studies are needed to understand how students' computational thinking abilities develop in more complex contexts. Individual differences need to be considered because of individual factors such as motivation, interests, and learning styles, which can affect their math and computational thinking skills. Finally, the assessment tools used to measure computational thinking capabilities may have limitations in accuracy and reliability. The development of a more comprehensive assessment tool may be necessary.

Conclusion

Based on the analysis of students' *computational thinking* skills in solving problems in social arithmetic materials, it was found that computational thinking ability was greatly influenced by the level of initial mathematical ability. Students with high initial mathematical abilities are able to meet all computational thinking indicators, especially in problems with lower levels of difficulty, but still face obstacles in problems that require in-depth analysis. Students with moderate mathematical abilities show good ability, although they still need special reinforcement on the abstraction aspect to solve problems systematically. Meanwhile, students with low mathematical abilities have difficulty on almost all aspects of computational thinking, especially in pattern recognition, abstraction, and algorithmic thinking, reflecting a lack of conceptual understanding. Overall, these findings suggest that strengthening computational thinking skills, especially at the abstraction and algorithm stages, is necessary to assist students with varying levels of mathematical ability in solving problems effectively. Previous studies on scaffolding computational thinking skills have been implemented in geometry topics, with results indicating an improvement in students' computational thinking abilities (Purnani et al., 2024). Therefore, future research is recommended to develop appropriate scaffolding strategies to enhance abstraction and algorithm skills among students categorized as having low to moderate mathematical abilities within the context of social arithmetic.

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