

1. Incorrect due to **lexical interpretation error** of Multilingual LLM in target low resource language

Explanation: term “**genap**” in question “Pira probabilitas yen jumlah angka sing dipilih Paul lan Jesse **iku genap?**” is mistranslated as “**is also prime?**” instead of “**is even?**”. When the input is back-translated to Indonesian language, the LLM correctly answer the question. This particular insight is an interesting finding, suggesting that in addition to improving the multilingual capability of LLMs in target low resource language by proposing new data in target languages, it is also important to understand the role of pivoting languages, which language can better provide more accurate concept representation that is close to the target low resource language.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (INCORRECT)	Input: Back-translated to Indonesian (CORRECT)
<p>Pan jenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question:</p> <p>Paul lan Jesse saben-saben milih acak siji angka saka enem wilangan prima kapisanan. Pira probabilitas yen jumlah angka sing dipilih Paul lan Jesse iku genap?</p> <p>Answer:</p> <p>To determine the probability that the sum of two randomly chosen single-digit prime numbers is even, we need to follow these steps:</p> <p>Step 1: Identify the single-digit prime numbers.</p> <p>The single-digit prime numbers are: 2, 3, 5, 7.</p> <p>There are 4 such numbers.</p> <p>Step 2: Determine the total number of possible outcomes.</p> <p>Since each of the two numbers can be any of the 4 prime numbers, the total number of possible outcomes is:</p> $4 \times 4 = 16$ <p>Step 3: Determine the number of favorable outcomes where the sum of the two chosen numbers is even.</p> <p>The sum of two numbers is even if both numbers are either even or both are odd.</p> <p>Among the single-digit prime numbers, there is only one even number (2) and three odd numbers (3, 5, 7).</p> <p>The number of ways to choose two even numbers is:</p> $1 \times 1 = 1$ <p>The number of ways to choose two odd numbers is:</p> $3 \times 3 = 9$ <p>So, the total number of favorable outcomes is:</p> $1 + 9 = 10$ <p>Step 4: Calculate the probability.</p> <p>The probability that the sum of the two chosen numbers is even is the number of favorable outcomes divided by the total number of possible outcomes:</p> $\frac{10}{16} = \frac{5}{8}$ <p>Therefore, the probability that the sum of the two chosen numbers is even is:</p> <div><div><div>8</div><div>5</div></div></div>	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution.</p> <p>Question:</p> <p>Paul and Jesse each randomly select a number from the first six prime numbers. What is the probability that the sum of the chosen numbers is also prime?</p> <p>Answer:</p> <p>To determine the probability that the sum of the numbers chosen by Paul and Jesse is also prime, we need to follow these steps</p> <ol style="list-style-type: none">Identify the first six prime numbers.Determine all possible pairs of numbers that Paul and Jesse can choose.Identify which of these pairs sum to a prime number.Calculate the probability by dividing the number of favorable outcomes by the total number of possible outcomes. <p>Step 1: Identify the first six prime numbers.</p> <p>The first six prime numbers are: (2, 3, 5, 7, 11, 13).</p> <p>Step 2: Determine all possible pairs of numbers that Paul and Jesse can choose.</p> <p>Since each person can choose any of the six prime numbers, there are (6 x 6 = 36) possible pairs.</p> <p>Step 3: Identify which of these pairs sum to a prime number.</p> <p>We will check each pair to see if their sum is a prime number :</p> <ul style="list-style-type: none">(2 + 2 = 4) (not prime)(2 + 3 = 5) (prime)(2 + 5 = 7) (prime)(2 + 7 = 9) (not prime)(2 + 11 = 13) (prime)(2 + 13 = 15) (not prime)(3 + 2 = 5) (prime)(3 + 3 = 6) (not prime)(3 + 5 = 8) (not prime)(3 + 7 = 10) (not prime)(3 + 11 = 14) (not prime)(3 + 13 = 16) (not prime)(5 + 2 = 7) (prime)(5 + 3 = 8) (not prime)(5 + 5 = 10) (not prime)(5 + 7 = 12) (not prime)(5 + 11 = 16) (not prime)(5 + 13 = 18) (not prime)(7 + 2 = 9) (not prime)(7 + 3 = 10) (not prime)(7 + 5 = 12) (not prime)7	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci.</p> <p>Question: Paul dan Jesse masing-masing memilih secara acak satu angka dari enam bilangan prima pertama. Berapa probabilitas bahwa jumlah angka yang dipilih Paul dan Jesse adalah genap?</p> <p>Answer: To determine the probability that the sum of the numbers chosen by Paul and Jesse is even, we need to follow these steps:</p> <ol style="list-style-type: none">Identify the first six prime numbers.Determine the possible outcomes when Paul and Jesse each choose a number.Identify the conditions under which the sum of two numbers is even.Count the number of favorable outcomes.Calculate the probability. <p>Step 1: Identify the first six prime numbers.</p> <p>The first six prime numbers are: 2, 3, 5, 7, 11, 13.</p> <p>Step 2: Determine the possible outcomes when Paul and Jesse each choose a number.</p> <p>Since each of them can choose any of the 6 prime numbers, the total number of possible outcomes is:</p> $6 \times 6 = 36$ <p>Step 3: Identify the conditions under which the sum of two numbers is even.</p> <p>The sum of two numbers is even if both numbers are either even or both are odd.</p> <p>Among the first six prime numbers, there is only one even number (2) and five odd numbers 3, 5, 7, 11, 13.</p> <p>Step 4: Count the number of favorable outcomes.</p> <p>The number of ways Paul can choose an even number and Jesse can choose an even number is:</p> $1 \times 1 = 1$ <p>The number of ways Paul can choose an odd number and Jesse can choose an odd number is:</p> $5 \times 5 = 25$ <p>Therefore, the total number of favorable outcomes is:</p> $1 + 25 = 26$ <p>Step 5: Calculate the probability.</p> <p>The probability that the sum of the numbers chosen by Paul and Jesse is even is the number of favorable outcomes divided by the total number of possible outcomes:</p> $\frac{26}{36} = \frac{13}{18}$ <p>Thus, the probability that the sum of the numbers chosen by Paul and Jesse is even is:</p> <div><div><div>13</div><div>18</div></div></div>

2. Incorrect due to **lexical interpretation error** of Multilingual LLM in target low resource language

Explanation: LLM incorrectly catches phrase “1.000.000 lire” in question as an exchange rate between lire and dollars. This sample exemplifies how a LLM may not understand the phrase or context in question when it is delivered in target low resource language.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (CORRECT)	Input: Back-translated to Indonesian (CORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question: Ing taun 1992, aku sak scoop sendok es krim gelato ing Italia regane 1200 lire. Gelato sing jumlahé padha bakal regane \$1.50 ing Amerika Serikat. Yen nggunakake kurs tukar sing padha antarane lire lan dolar, pira dolar sing padha karo 1.000.000 lire?</p> <p>Answer: 1200000</p> <p>To solve the problem, we need to convert the amount of gelato from lire to dollars. We are given the following conversion rates:</p> <ol style="list-style-type: none">The cost of gelato in Italy is 1200 lire.The cost of gelato in the United States is \$1.50.The exchange rate between lire and dollars is 1.000,000 lire per dollar. <p>First, we need to find out how many dollars 1200 lire is equivalent to. We do this by dividing the amount in lire by the exchange rate:</p> $\text{Dollars} = \text{Lire} / \text{Exchange Rate} = 1200 / 1,000,000$ <p>Simplifying the fraction, we get:</p> $\text{Dollars} = 1200 \div 1000 / 1,000,000 \div 1000 = 1.2 / 1,000 = 0.0012$ <p>Therefore, 1200 lire is equivalent to 0.0012 dollars.</p> <p>Next, we need to find out how many dollars 1.50 dollars is equivalent to in lire. We do this by multiplying the amount in dollars by the exchange rate:</p> $\text{Lire} = \text{Dollars} \times \text{Exchange Rate} = 1.50 \times 1,000,000$ <p>Simplifying the multiplication, we get:</p> $\text{Lire} = 1.50 \times 1,000,000 = 1,500,000$ <p>Therefore, 1.50 dollars is equivalent to 1,500,000 lire.</p> <p>Finally, we need to find out how many dollars 1,000,000 lire is equivalent to. We do this by dividing the amount in lire by the exchange rate:</p> $\text{Dollars} = \text{Lire} / \text{Exchange Rate} = 1,000,000 / 1,000,00$	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution:</p> <p>Question: In 1992, a scoop of gelato could be bought in Italy for 1200 lire. The same gelato would cost \$1.50 in the United States. At the equivalent exchange rate between lire and dollars, how many dollars is 1,000,000 lire equivalent to?</p> <p>Answer: To determine how many dollars 1,000,000 lire is equivalent to, we need to find the exchange rate between lire and dollars. We know that in 1992, a scoop of gelato cost 1200 lire in Italy and \$1.50 in the United States. Therefore, the exchange rate is:</p> $\text{Exchange rate} = \text{Cost in dollars} / \text{Cost in lire} = 1.50 / 1200$ <p>Simplifying the fraction, we get:</p> $\text{Exchange rate} = 1.50 \div 1.50 / 1200 \div 1.50 = 1 / 800$ <p>This means that 1 lire is equivalent to 1/800 dollars. To find out how many dollars 1,000,000 lire is equivalent to, we multiply 1,000,000 by the exchange rate:</p> $1,000,000 \text{ lire} \times 1 \text{ dollar} / 800 \text{ lire} = 1,000,000 / 800 \text{ dollars}$ <p>Simplifying the division, we get:</p> $1,000,000 / 800 = 1250 \text{ dollars}$ <p>Therefore, 1,000,000 lire is equivalent to 1250 dollars.</p>	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question: Pada tahun 1992, membeli satu scoop es krim gelato di Italia seharga 1200 lire. Gelato dalam jumlah yang sama akan berharga \$1.50 di Amerika Serikat. Jika menggunakan kurs tukar yang sama antara lire dan dolar, berapa dolar yang setara dengan 1.000.000 lire?</p> <p>Answer:</p> $1,000,000 \text{ lire} = 1,250 \text{ dollars.}$ <p>To solve the problem, we need to determine the exchange rate between lire and dollars based on the given information and then use that exchange rate to convert 1,000,000 lire into dollars.</p> <p>1. Determine the exchange rate:</p> <ul style="list-style-type: none">We know that 1200 lire is equivalent to \$1.50.To find the exchange rate (how many dollars are in one lire), we divide the amount in dollars by the amount in lire: $\text{Exchange rate} = 1.50 \text{ dollars} / 1200 \text{ lire} = 0.00125 \text{ dollars per lire}$ <p>2. Convert 1,000,000 lire to dollars:</p> <ul style="list-style-type: none">Now that we have the exchange rate, we can convert any amount of lire to dollars by multiplying the amount in lire by the exchange rate.For 1,000,000 lire: $1,000,000 \text{ lire} \times 0.00125 \text{ dollars per lire} = 1250 \text{ dollars}$ <p>Therefore, 1,000,000 lire is equivalent to 1250 dollars.</p>

3. Incorrect due to **lexical interpretation error** of Multilingual LLM in target low resource language

Explanation: LLM incorrectly catches a phrase “**Ana enem mobil mandheg**” as a subject (PERSON NAME) with a property “**Ana has ...**”, instead of “**There are six cars stopped...**”. Therefore, the reasoning and answer are incorrect. However, it is interesting to observe that the backtranslation in Indonesian language has a different conceptual workflow or slower reasoning. Therefore, due to the token length limitation, the generation will be cut before the final answer is computed. This result provides an insight that each pivot language may have a different conceptual workflow or slower reasoning when solving mathematical problems.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (CORRECT)	Input: Back-translated to Indonesian (INCORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question:</p> <p>Ana enem mobil mandheg ing lampu abang, siji-siji. Ing lampu abang kuwi ana telung jalur, siji jalur kanggo belok kiwa, siji jalur kanggo maju terus, lan siji jalur kanggo belok tengen. Ana pirang cara mobil-mobil kuwi bisa baris supaya kabeh telung jalur kuwi keisi? Elinga, yen mobil pisanan belok kiwa lan mobil kapindho maju terus, iki dianggep beda karo mobil pisanan maju terus lan mobil kapindho belok kiwa. Tegese, mobil-mobil kuwi bisa dibedakake siji-sijine, nanging mandheg ing perempatan ing urutan barisan sing wis tetep.</p> <p>Answer:</p> <p>To solve the problem, let's break it down step by step.</p> <p>1. Understand the Problem:</p> <ul style="list-style-type: none">Ana has an odd number of lamps.She turns on the first lamp.She then turns off the second lamp.She turns on the third lamp.She then turns off the fourth lamp.This pattern continues until she reaches the last lamp. <p>2. Analyze the Pattern:</p> <ul style="list-style-type: none">The first lamp is on.The second lamp is off.The third lamp is on.The fourth lamp is off.This pattern alternates between on and off. <p>3. Determine the State of the Last Lamp:</p> <ul style="list-style-type: none">Since the number of lamps is odd, the last lamp will be in a different state than the second-to-last lamp.If the second-to-last lamp is off, the last lamp will be on.If the second-to-last lamp is on, the last lamp will be off. <p>4. Generalize the Pattern:</p> <ul style="list-style-type: none">For any odd number n:The first lamp is on.The second lamp is off.The third lamp is on.The fourth lamp is off.This pattern continues until the n-th lamp.Since n is odd, the n-th lamp will be on. <p>Conclusion:</p> <ul style="list-style-type: none">The last lamp will always be on when the number of lamps is odd. <p>Therefore, the final answer is:</p> <div>on</div>	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution.:</p> <p>Question:</p> <p>Six cars stop at a red light, one after another. At the red light, there are three lanes: one for left turns, one for going straight, and one for right turns. In how many ways can the cars park so that all three lanes are occupied? Note: If the first car turns left and the second goes straight, this is considered different from the first car going straight and the second turning left. In other words, the cars are distinguishable, but parking at the intersection is done in a fixed order.</p> <p>Answer:</p> <p>540</p> <p>To determine the number of ways the six cars can park so that all three lanes (left, straight, and right) are occupied, we can use the principle of inclusion-exclusion.</p> <p>First, let's calculate the total number of ways the six cars can park without any restrictions. Since each car has 3 choices (left, straight, or right), the total number of ways is:</p> $3^6 = 729$ <p>Next, we need to subtract the number of ways in which at least one lane is empty. We will use the principle of inclusion-exclusion to do this.</p> <p>1. Subtract the number of ways in which at least one lane is empty:</p> <ul style="list-style-type: none">If one lane is empty, there are 2 lanes left for the cars to park in. The number of ways to park the six cars in 2 lanes is: $2^6 = 64$ <ul style="list-style-type: none">Since any one of the three lanes can be empty, we multiply by 3: $3 \times 64 = 192$ <p>2. Add back the number of ways in which at least two lanes are empty:</p> <ul style="list-style-type: none">If two lanes are empty, there is only 1 lane left for the cars to park in. The number of ways to park the six cars in 1 lane is: $1^6 = 1$ <ul style="list-style-type: none">Since any two of the three lanes can be empty, we multiply by C(3,2) = 3: $3 \times 1 = 3$ <p>Using the principle of inclusion-exclusion, the number of ways to park the six cars so that all three lanes are occupied is:</p> $729 - 192 + 3 = 540$ <p>Thus, the number of ways the six cars can park so that all three lanes are occupied is:</p> <div>540</div>	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question:</p> <p>Ada enam mobil berhenti di lampu merah, satu per satu. Di lampu merah tersebut ada tiga jalur, satu jalur untuk belok kiri, satu jalur untuk lurus, dan satu jalur untuk belok kanan. Berapa banyak cara mobil-mobil tersebut dapat berbaris sehingga ketiga jalur tersebut terisi? Ingat, jika mobil pertama belok kiri dan mobil kedua lurus, ini dianggap berbeda dengan mobil pertama lurus dan mobil kedua belok kiri. Artinya, mobil-mobil tersebut dapat dibedakan satu sama lain, namun berhenti di persimpangan dalam urutan antrian yang tetap.</p> <p>Answer:</p> <p>To determine the number of ways the six cars can line up such that all three lanes (left, straight, and right) are filled, we can use the principle of inclusion-exclusion.</p> <p>First, let's calculate the total number of ways the six cars can line up without any restrictions. Since each car has 3 choices (left, straight, or right), the total number of arrangements is:</p> $3^6 = 729$ <p>Next, we need to subtract the number of arrangements where at least one lane is empty. There are three cases to consider: the left lane is empty, the straight lane is empty, or the right lane is empty.</p> <p>Case 1: The left lane is empty.</p> <p>If the left lane is empty, each car has only 2 choices (straight or right). Therefore, the number of arrangements is:</p> $2^6 = 64$ <p>Case 2: The straight lane is empty.</p> <p>If the straight lane is empty, each car has only 2 choices (left or right). Therefore, the number of arrangements is:</p> $2^6 = 64$ <p>Case 3: The right lane is empty.</p> <p>If the right lane is empty, each car has only 2 choices (left or straight). Therefore, the number of arrangements is:</p> $2^6 = 64$ <p>Now, we add the number of arrangements where at least two lanes are empty. There are three cases to consider: the left and straight lanes are empty, the left and right lanes are empty, or the straight and right lanes are empty.</p> <p>Case 4: The left and straight lanes are empty.</p> <p>If the left and straight lanes are empty, each car has only 1 choice (right). Therefore, the number of arrangements is:</p> $1^6 = 1$ <p>Case 5: The left and right lanes are empty.</p> <p>If the left and right lanes are empty, each car has only 1 choice (straight). Therefore, the number of arrangements is:</p> $1^6 = 1$ <p>Case 6: The straight and right lanes are empty.</p> <p>If the straight and right lanes are empty, each car has only 1 choice (left). Therefore, the number of arrangements is:</p> 1^6

4. Incorrect due to **lexical interpretation error** of Multilingual LLM in target low resource language

Explanation: LLM incorrectly catches a phrase in the main question “**Pira jumlahe angka asli karo angka sing digit-digite diwalik kuwi**” as “**the sum of the digits of ...**”, instead of “**The difference between the number and the number with its digits reversed is 27**”. This results in incorrect final solution, even though the reasoning is correct. It is also interesting to observe that Back-Translation in Indonesian, although providing a final correct answer, it is hallucinated and inconsistent by providing the intermediate answer (115) in the beginning of reasoning step.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (CORRECT)	Input: Back-translated to Indonesian (CORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question: Jumlah angka-angka saka sawijining bilangan loro digit yaiku 13. Bedané antara angka kuwi karo angka sing digit-digité diwalik yaiku 27. Pira jumlahé angka asli karo angka sing digit-digité diwalik kuwi?</p> <p>Answer: Let's denote the two-digit number as $10a + b$, where a and b are its digits. We are given two conditions:</p> <ul style="list-style-type: none">• The sum of the digits is 13, so $a + b = 13$.• The number formed by reversing the digits is 27 less than the original number, so $10b + a = 10a + b - 27$. <p>First, let's simplify the second equation:</p> $10b + a = 10a + b - 27$ <p>Subtract a and b from both sides:</p> $9b = 9a - 27$ <p>Divide both sides by 9:</p> $b = a - 3$ <p>Now we have a system of linear equations:</p> <ol style="list-style-type: none">1. $a + b = 13$2. $b = a - 3$ <p>Substitute the expression for b from the second equation into the first equation:</p> $a + a - 3 = 13$ <p>Combine like terms:</p> $2a - 3 = 13$ <p>Add 3 to both sides:</p> $2a = 16$ <p>Divide both sides by 2:</p> $a = 8$ <p>Now substitute $a = 8$ back into the second equation to find b:</p> $b = 8 - 3$ $b = 5$ <p>So the original number is $10a + b = 10 \times 8 + 5 = 85$. The sum of the digits of the original number is $8 + 5 = 13$. The number formed by reversing the digits is $10b + a = 10 \times 5 + 8 = 58$. The sum of the digits of the reversed number is $5 + 8 = 13$. Therefore, the sum of the digits of the original number and the reversed number is $13 + 13 = 26$. The answer is 26.</p>	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution:</p> <p>Question: The sum of the digits of a two-digit number is 13. The difference between the number and the number with its digits reversed is 27. What is the sum of the original number and the number with its digits reversed?</p> <p>Answer: Let's denote the two-digit number as $10a + b$, where a and b are its digits. According to the problem, the sum of the digits is 13, so we have the equation:</p> $a + b = 13$ <p>The number with its digits reversed is $10b + a$. The difference between the original number and the number with its digits reversed is 27, so we have the equation:</p> $10a + b - (10b + a) = 27.$ <p>Simplifying the left side, we get:</p> $10a + b - 10b - a = 27,$ $9a - 9b = 27,$ $a - b = 3$ <p>Now we have a system of linear equations:</p> $a + b = 13,$ $a - b = 3$ <p>We can solve this system by adding the two equations together:</p> $(a + b) + (a - b) = 13 + 3,$ $2a = 16,$ $a = 8.$ <p>Substituting $a = 8$ back into the first equation:</p> $8 + b = 13,$ $b = 5$ <p>So, the original number is $10a + b = 10 \times 8 + 5 = 85$. The number with its digits reversed is $10b + a = 10 \times 5 + 8 = 58$. The sum of the original number and the number with its digits reversed is:</p> $85 + 58 = 143$ <p>Therefore, the answer is:</p> <div>143</div>	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question: Jumlah digit dari suatu bilangan dua digit adalah 13. Selisih antara bilangan tersebut dengan bilangan yang digit-digitnya dibalik adalah 27. Berapakah jumlah dari bilangan asli dan bilangan yang digit-digitnya dibalik itu?</p> <p>Answer: 115</p> <p>To solve the problem, let's denote the two-digit number as $10a + b$, where a and b are its digits. We are given two pieces of information:</p> <ol style="list-style-type: none">1. The sum of the digits is 13.2. The difference between the number and the number with its digits reversed is 27. <p>From the first piece of information, we can write the equation:</p> $a + b = 13$ <p>From the second piece of information, we can write the equation:</p> $10a + b - (10b + a) = 27$ <p>Simplifying the left side, we get:</p> $10a + b - 10b - a = 27$ $9a - 9b = 27$ <p>Dividing both sides by 9, we get:</p> $a - b = 3$ <p>Now we have a system of linear equations:</p> <ol style="list-style-type: none">1. $a + b = 13$2. $a - b = 3$ <p>To solve this system, we can add the two equations together:</p> $(a + b) + (a - b) = 13 + 3$ $2a = 16$ <p>Dividing both sides by 2, we get:</p> $a = 8$ <p>Next, we substitute $a = 8$ back into the first equation:</p> $8 + b = 13$ <p>Subtracting 8 from both sides, we get: $b = 5$ So, the original two-digit number is $10a + b = 10 \times 8 + 5 = 85$. The number with its digits reversed is $10b + a = 10 \times 5 + 8 = 58$. The sum of the original number and the number with its digits reversed is: $85 + 58 = 143$ Therefore, the answer is:</p> <div>143</div>

5. Incorrect due to **lexical interpretation error** and the corresponding **conceptual error** of Multilingual LLM in target low resource language

Explanation: Multilingual LLM interprets word pairs (“**wong**”-“**kantor**”) in Javanese language as (“**object**”-“**bins**”), instead of (“**person**”-“**kantor**”); So it then reasons based on the concept of object sampling as a group. The LLM misinterprets the main question “**ana pira cara kanggo nempatake 3 wong ing 5 kantor sing beda**” as a combinatorial problem (group sampling) instead of factorial or individual sampling.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (CORRECT)	Input: Back-translated to Indonesian (CORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question:</p> <p>Yen ora ana sing bareng ngenggoni siji kantor, ana pira cara kanggo nempatake 3 wong ing 5 kantor sing beda? (Sabene wong entuk persis siji kantor).</p> <p>Answer:</p> <p>To solve the problem, let's break it down step by step.</p> <p>1. Understand the problem:</p> <p>We need to find out how many ways we can distribute 3 wong into 5 different kisors.</p> <p>2. Identify the type of problem:</p> <p>This is a problem of distributing indistinguishable objects wong into distinguishable bins kisors.</p> <p>3. Use the formula for combinations with repetition:</p> <p>The formula to find the number of ways to distribute n indistinguishable objects into k distinguishable bins is given by:</p> $n + k - 1 \text{ C } k - 1$ <p>Here, n = 3 wong and k = 5 kisors.</p> <p>4. Substitute the values into the formula:</p> $n + k - 1 \text{ C } k - 1 = 3 + 5 - 1 \text{ C } 5 - 1 = 7 \text{ C } 4$ <p>5. Calculate the binomial coefficient:</p> <p>The binomial coefficient 7 C 4 is calculated as:</p> $7 \text{ C } 4 = 7! / 4!(7 - 4)! = 7! / 4! \times 3!$ <p>6. Simplify the factorials:</p> <ul style="list-style-type: none">• $7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$• $4! = 4 \times 3 \times 2 \times 1 = 24$• $3! = 3 \times 2 \times 1 = 6$ <p>7. Substitute the factorial values back into the binomial coefficient formula:</p> $7 \text{ C } 4 = 5040 / 24 \times 6 = 5040 / 144 = 35$ <p>Therefore, the number of ways to distribute 3 wong into 5 different kisors is 35.</p>	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution:</p> <p>Question:</p> <p>If no one shares an office, how many ways are there to assign 3 people to 5 different offices? (Each person gets one office.)</p> <p>Answer:</p> <p>To determine the number of ways to assign 3 people to 5 different offices, where each person gets one office and no one shares an office, we can follow these steps:</p> <p>1. Identify the choices for each person:</p> <ol style="list-style-type: none">1. The first person has 5 choices since there are 5 different offices.2. After the first person has chosen an office, the second person has 4 choices since one office is already taken.3. After the second person has chosen an office, the third person has 3 choices since two offices are already taken. <p>2. Calculate the total number of ways:</p> <ul style="list-style-type: none">• The total number of ways to assign the offices is the product of the number of choices each person has.• Therefore, the total number of ways is $5 \times 4 \times 3$. <p>3. Perform the multiplication:</p> $5 \times 4 = 20$ $20 \times 3 = 60$ <p>So, the total number of ways to assign 3 people to 5 different offices is 60.</p>	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question:</p> <p>Jika tidak ada yang berbagi kantor, berapa banyak cara untuk menempatkan 3 orang ke dalam 5 kantor yang berbeda? (Setiap orang mendapatkan persis satu kantor).</p> <p>Answer:</p> <p>To determine the number of ways to assign 3 people to 5 different lockers, where each person gets exactly one locker, we can follow these steps:</p> <p>1. Identify the choices for each person:</p> <ul style="list-style-type: none">• The first person has 5 choices since they can choose any of the 5 lockers.• The second person has 4 choices since one locker is already taken.• The third person has 3 choices since two lockers are already taken. <p>2. Calculate the total number of ways:</p> <ul style="list-style-type: none">• The total number of ways to assign the lockers is the product of the number of choices each person has.• Therefore, the total number of ways is $5 \times 4 \times 3$. <p>Perform the multiplication:</p> $5 \times 4 = 20$ $20 \times 3 = 60$ <p>So, the total number of ways to assign 3 people to 5 different lockers is 60.</p>

6. Incorrect due to token length constrain of Multilingual LLM

Explanation: In Javanese language, the target LLM is able to reason correctly, but it is being cut when the LLM tries find the values of positive integers {r,s,t} (roots). The back-translation error is also mainly due to the restriction of token length. For example, in pivot language=English, the reasoning almost reach the proces s of computing the value of a, while in pivot language==Indonesian, the reasoning has produced the correct values of variable a and c, but it is being cut.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (INCORRECT)	Input: Back-translated to Indonesian (INCORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question:</p> <p>Steve ngomong marang Jon, "Aku mikirake ana polinomial sing akare kabeh bilangan bulat positif. Polinomial iki nduweni bentuk $P(x) = 2x^3 - 2ax^2 + (a^2 - 81)x - c$ kanggo sawetara bilangan bulat positif a lan c. Apa kowe bisa nyebutake nilai a lan c?"</p> <p>Sawise ngitung-ngitung, Jon ngomong, "Ana luwih saka siji polinomial sing kaya ngono."</p> <p>Steve ngomong, "Kowe bener. Iki nilai a-ne." Dheweke nulis siji bilangan bulat positif lan takon, "Saiki kowe bisa nyebutake nilai c?"</p> <p>Jon ngomong, "Isih ana loro kemungkinan nilai c."</p> <p>Golekana jumlah saka loro kemungkinan nilai c kasebut.</p> <p>Answer:</p> <p>To solve the problem, we start by analyzing the given polynomial $P(x) = 2x^3 - 2ax^2 + (a^2 - 81)x - c$.</p> <p>We know that $P(x)$ has three positive integer roots, say r, s, and t. By Vieta's formulas, we can express the coefficients of the polynomial in terms of its roots:</p> <ul style="list-style-type: none">The sum of the roots $r + s + t = a$The sum of the products of the roots taken two at a time $rs + rt + st = (a^2 - 81)/2$The product of the roots $rst = c/2$ <p>Since r, s, and t are positive integers, a must also be a positive integer. We need to find the possible values of a such that $rs + rt + st = (a^2 - 81)/2$ is an integer.</p> <p>This implies that $a^2 - 81$ must be even, which means a^2 must be odd. Therefore, a must be an odd integer.</p> <p>Next, we test small odd values of a to find possible sets of roots r, s, and t.</p> <ol style="list-style-type: none">For a = 9: $r + s + t = 9$ $rs + rt + st = (9^2 - 81)/2 = (81 - 81)/2 = 0$ This is not possible since r, s, and t are positive integers.For a = 11: $r + s + t = 11$ $rs + rt + st = (11^2 - 81)/2 = (121 - 81)/2 = 20$ <p>We need to find positive integers r, s, and t such that $r + s + t = 11$ and $rs + rt + st$</p>	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution:</p> <p>Question:</p> <p>Steve tells Jon, "I'm thinking of a polynomial whose roots are all positive integers. This polynomial has the form $P(x) = 2x^3 - 2ax^2 + (a^2 - 81)x - c$ for some positive integers a and c. Can you tell me the values of a and c?"</p> <p>After some calculations, Jon says, "There is more than one such polynomial."</p> <p>Steve says, "You're right. Here is the value of a." He writes down a positive integer and asks, "Can you tell me the value of c?"</p> <p>Jon says, "There are still two possible values for c."</p> <p>Find the sum of these two possible values for c.</p> <p>Answer:</p> <p>Given the polynomial $P(x) = 2x^3 - 2ax^2 + (a^2 - 81)x - c$ with roots r, s, t (all positive integers), we can use Vieta's formulas to relate the coefficients of the polynomial to sums and products of its roots. Vieta's formulas tell us:</p> <ol style="list-style-type: none">$r + s + t = a$$rs + rt + st = (a^2 - 81)/2$$rst = c/2$ <p>From the first equation, $a = r + s + t$. Substituting this into the second equation, we get:</p> $rs + rt + st = ((r + s + t)^2 - 81)/2$ <p>Expanding and simplifying the right-hand side, we have:</p> $\begin{aligned} rs + rt + st &= (r^2 + s^2 + t^2 + 2rs + 2rt + 2st - 81)/2 \\ rs + rt + st &= (r^2 + s^2 + t^2)/2 + rs + rt + st - 81/2 \\ 0 &= (r^2 + s^2 + t^2)/2 - 81/2 \\ r^2 + s^2 + t^2 &= 81 \end{aligned}$ <p>We need to find all sets of positive integers (r, s, t) that satisfy $r^2 + s^2 + t^2 = 81$. Let's consider the possible values for r, s, and t.</p> <p>If r = 9, then $s^2 + t^2 = 0$, which is not possible since s and t are positive integers.</p> <p>If r = 8, then $s^2 + t^2 = 17$. The possible pairs (s, t) are (4, 1) and (1, 4)</p>	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question:</p> <p>Steve berkata kepada Jon, "Aku memikirkan ada sebuah polinomial yang semua akarnya adalah bilangan bulat positif. Polinomial ini berbentuk $P(x) = 2x^3 - 2ax^2 + (a^2 - 81)x - c$ untuk beberapa bilangan bulat positif a dan c. Bisakah kamu sebutkan nilai a dan c?"</p> <p>Setelah menghitung, Jon berkata, "Ada lebih dari satu polinomial yang seperti itu."</p> <p>Steve berkata, "Kamu benar. Ini nilai a-nya." Dia menulis sebuah bilangan bulat positif dan bertanya, "Sekarang bisakah kamu sebutkan nilai c?"</p> <p>Jon berkata, "Masih ada dua kemungkinan nilai c."</p> <p>Carilah jumlah dari dua kemungkinan nilai c tersebut.</p> <p>Answer:</p> <p>Given the polynomial $P(x) = 2x^3 - 2ax^2 + (a^2 - 81)x - c$ with integer positive roots, let's denote the roots by p, q, r. By Vieta's formulas, we have the following relationships:</p> $\begin{aligned} p + q + r &= a \\ pq + qr + rp &= (a^2 - 81)/2 \\ pqr &= c/2 \end{aligned}$ <p>Since p, q, r are positive integers, a must be an integer such that $a^2 - 81$ is even, which means a must be odd. Let's test some odd values of a.</p> <p>First, let's try a = 15:</p> $p + q + r = 15$ $pq + qr + rp = (15^2 - 81)/2 = (225 - 81)/2 = 72$ <p>We need to find positive integers p, q, r that satisfy these equations. Let's try p = 2, q = 6, r = 7:</p> $p + q + r = 2 + 6 + 7 = 15$ $pq + qr + rp = 2 \cdot 6 + 6 \cdot 7 + 7 \cdot 2 = 12 + 42 + 14 = 68 \neq 72$ <p>So, p = 2, q = 6, r = 7 is not a solution. Let's try p = 3, q = 6, r = 6:</p> $p + q + r = 3 + 6 + 6 = 15$ $pq + qr + rp = 3 \cdot 6 + 6 \cdot 6 + 6 \cdot 3 = 18 + 36 + 18 = 72$ <p>So, p = 3, q = 6, r = 6 is a solution. In this case,</p> $c = 2pqr = 2 \cdot 3$

7. Incorrect due to the **generalization error and misinterpretation of the context** of Multilingual LLM

Explanation: Target multilingual LLM that processes inputs in Javanese language interpret the context of question too general. The question is specifically asks about “**the sum of three consecutive positive integers**”, but the LLM incorrectly generalizes the question as “**the sum of n consecutive positive integers**”.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (CORRECT)	Input: Back-translated to Indonesian (CORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question: Apa wilangan kubik sempuma positif paling cilik sing bisa ditulis dadi jumlah telung wilangan bulat berturut-turut?</p> <p>Answer: To determine the smallest positive perfect cube that can be written as the sum of consecutive positive integers, we start by expressing the sum of n consecutive positive integers starting from a as follows:</p> $a + (a + 1) + (a + 2) + \cdots + (a + n - 1) = n(2a + n - 1)/2$ <p>We need this sum to be a perfect cube, so we set it equal to k^3 for some integer k:</p> $n(2a + n - 1)/2 = k^3$ <p>This equation can be rearranged to:</p> $n(2a + n - 1) = 2k^3$ <p>Since n and $(2a + n - 1)$ are integers, n must be a divisor of $2k^3$. We will test small values of n to find the smallest possible k.</p> <p>1. For $n = 1$:</p> $1(2a + 1 - 1) = 2k^3 \Rightarrow 2a = 2k^3 \Rightarrow a = k^3$ <p>The smallest positive integer k is 1, so $a = 1^3 = 1$. The sum is 1, which is a perfect cube.</p> <p>2. For $n = 2$:</p> $2(2a + 2 - 1) = 2k^3 \Rightarrow 2(2a + 1) = 2k^3 \Rightarrow 2a + 1 = k^3$ <p>The smallest positive integer k such that k^3 is odd is 1, so $k = 1$. Then $2a + 1 = 1^3 = 1 \Rightarrow 2a = 0 \Rightarrow a = 0$, which is not a positive integer.</p> <p>3. For $n = 3$:</p> $3(2a + 3 - 1) = 2k^3 \Rightarrow 3(2a + 2) = 2k^3$	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution:</p> <p>Question: What is the smallest positive perfect cube that can be written as the sum of three consecutive integers?</p> <p>Answer: To find the smallest positive perfect cube that can be written as the sum of three consecutive integers, let's denote the three consecutive integers as $n-1$, n, and $n+1$. The sum of these three integers is:</p> $(n-1) + n + (n+1) = 3n$ <p>We need to find the smallest positive integer n such that $3n$ is a perfect cube. Let's denote the perfect cube by k^3, where k is a positive integer. Therefore, we have:</p> $3n = k^3$ <p>This implies that k^3 must be divisible by 3. Since k^3 is divisible by 3, k itself must be divisible by 3. Let's write k as $3m$, where m is a positive integer. Substituting $k = 3m$ into the equation $3n = k^3$, we get:</p> $3n = (3m)^3 = 27m^3$ <p>Simplifying this, we find: $n = 9m^3$ The smallest positive integer value for m is 1. Substituting $m = 1$ into the equation</p> $n = 9m^3$ <p>we get: $n = 9 \cdot 1^3 = 9$ Therefore, the three consecutive integers are 8, 9, and 10. The sum of these integers is:</p> $8 + 9 + 10 = 27$ <p>Since $27 = 3^3$, it is a perfect cube. Thus, the smallest positive perfect cube that can be written as the sum of three consecutive integers is:</p> <div>27</div>	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question: Apa bilangan kubik sempuma positif terkecil yang dapat ditulis sebagai jumlah tiga bilangan bulat berurutan?</p> <p>Answer: Untuk menemukan bilangan kubik sempuma positif terkecil yang dapat ditulis sebagai jumlah tiga bilangan bulat berurutan, misalkan tiga bilangan bulat berurutan tersebut adalah $n-1$, n, dan $n+1$. Jumlah dari ketiganya adalah:</p> $(n-1) + n + (n+1) = 3n$ <p>Kita perlu menemukan bilangan kubik sempuma positif terkecil yang merupakan kelipatan dari 3. Bilangan kubik sempuma positif terkecil adalah $1^3 = 1$, tetapi 1 bukan kelipatan dari 3. Bilangan kubik sempuma positif berikutnya adalah $2^3 = 8$, tetapi 8 juga bukan kelipatan dari 3. Bilangan kubik sempuma positif berikutnya adalah $3^3 = 27$, dan 27 merupakan kelipatan dari 3. Maka dapat ditulis:</p> $27 = 3n \Rightarrow n = 9$ <p>Jadi, tiga bilangan bulat berurutan tersebut adalah 8, 9, dan 10. Jumlah dari ketiga bilangan tersebut adalah:</p> $8 + 9 + 10 = 27$ <p>Dengan demikian, bilangan kubik sempuma positif terkecil yang dapat ditulis sebagai jumlah tiga bilangan bulat berurutan adalah:</p> <div>27</div>

8. Incorrect due to **misinterpretation of numbers and unit confusion**

Explanation: The cost “\$1.30” and “\$6.80” are incorrectly used as the cost for the surface area and volume respectively, instead of the total cost of cube with different length of side. So LLM gives incorrect reasoning and answer due to the wrong interpretation of numbers and units. For English back-translation, LLM has a correct reasoning, but it is truncated and uncompleted (due to token length constraint). Similarly, For Indonesian back-translation, the generation was truncated so it never reaches the final answer.

Input origin: Javanese language (INCORRECT)	Input: Back-translated to English (INCORRECT)	Input: Back-translated to Indonesian (INCORRECT)
<p>Panjenengan yaiku ahli matematika. Tulung rampungna masalah ing ngisor iki lan wenehi solusi kanthi rinci:</p> <p>Question: Batangan emas palsu digawe saka nutupi kubus beton nganggo cat emas, mula regane cat gumantung karo luas permukaan, dene regane beton gumantung karo voluméne. Yen kubus ukuran 1 inci biayane \$1.30 lan kubus ukuran 2 inci biayane \$6.80, pira biaya nggawe kubus ukuran 3 inci?</p> <p>Answer: Kanggo nemtokake biaya nggawe kubus kanthi dawa sisi 3 inci, kita kudu ngitung loro bab: luas permukaan lan volume kubus, banjur nggunakake biaya saben unit sing wis diwenehake. Dhisik, ayo ngitung luas permukaan kubus. Rumusé yaiku:</p> $A = 6s^2$ <p>Kanggo kubus kanthi sisi 3 inci:</p> $A = 6 \times 3^2 = 6 \times 9 = 54 \text{ inci}^2$ <p>Sabanjuré, ngitung volume kubus. Rumusé yaiku:</p> $V = s^3$ <p>Kanggo kubus kanthi sisi 3 inci:</p> $V = 3^3 = 27 \text{ inci}^3$ <p>Kita diwenehi yèn biaya saben inci² permukaan yaiku \$1.30 lan biaya saben inci³ volume yaiku \$6.80. Mula, total biaya (C) kanggo nggawe kubus yaiku:</p> $C = 54 \times 1.30 + 27 \times 6.80$ <p>Saiki, ayo ngitung saben bagean:</p> $54 \times 1.30 = 70.20 \quad 27 \times 6.80 = 183.60$ <p>Tambahaké loro asil kasebut:</p> $C = 70.20 + 183.60 = 253.80$ <p>Mula, biaya kanggo nggawe kubus kanthi sisi 3 inci yaiku 253.80</p>	<p>You are a mathematics expert. Please solve the following problem and provide a detailed solution:</p> <p>Question: Fake gold blocks are made by covering concrete cubes with gold paint, so that the cost of the paint is proportional to the surface area while the cost of the concrete is proportional to the volume. If a 1-inch cube costs \$1.30 to make, while a 2-inch cube costs \$6.80, what is the cost of a 3-inch cube?</p> <p>Answer: To determine the cost of a 3-inch cube, we need to break down the cost into the cost of the concrete and the cost of the gold paint. Let's denote the cost of the concrete per cubic inch by c and the cost of the gold paint per square inch by p.</p> <p>First, compute the volume and surface area of a 1-inch cube:</p> <ul style="list-style-type: none">Volume: $1^3 = 1$ cubic inchSurface area: $6 \times 1^2 = 6$ square inches <p>The total cost of a 1-inch cube is:</p> $c \times 1 + p \times 6 = 1.30$ <p>which simplifies to:</p> $c + 6p = 1.30 \text{ (Equation 1)}$ <p>Next, compute the volume and surface area of a 2-inch cube:</p> <ul style="list-style-type: none">Volume: $2^3 = 8$ cubic inchesSurface area: $6 \times 2^2 = 24$ square inches <p>The total cost of a 2-inch cube is:</p> $c \times 8 + p \times 24 = 6.80$ <p>which simplifies to:</p> $8c + 24p = 6.80 \text{ (Equation 2)}$ <p>Simplify Equation 2 by dividing every term by 8:</p> $c + 3p = 0.85 \text{ (Equation 3)}$ <p>Now we have a system of linear equations: 1)</p> $c + 6p = 1.30 \quad 2) \quad c + 3p = 0.85$ <p>Eliminate c by subtracting Equation 3 from Equation 1:</p> $(c + 6p) - (c + 3p) = 1.30 - 0.85 \quad 3p = 0.45 \quad p = 0.15$ <p>Substitute p back into Equation 3 to find c:</p> $c + 3(0.15) = 0.85 \quad c + 0.45 = 0.85 \quad c = \span style="border: 1px solid black; padding: 0 2px;">0.4$	<p>Kamu adalah ahli matematika. Tolong selesaikan persoalan matematika berikut dan berikan solusinya secara rinci:</p> <p>Question: Batangan emas palsu dibuat dengan menutupi kubus beton menggunakan cat emas, sehingga biaya cat tergantung pada luas permukaan, sedangkan biaya beton tergantung pada volumenya. Jika kubus ukuran 1 inci biayanya \$1,30 dan kubus ukuran 2 inci biayanya \$6,80, berapa biaya membuat kubus ukuran 3 inci?</p> <p>Answer: To determine the cost of making a cube with a side length of 3 inches, we need to break down the problem into two parts: the cost of the concrete and the cost of the cat. First, let's find the volume and surface area of the cubes with side lengths of 1 inch and 2 inches.</p> <p>For a cube with a side length of 1 inch: Volume $V_1 = 1^3 = 1$ cubic inch Surface area</p> $A_1 = 6 \times 1^2 = 6 \text{ square inches}$ <p>For a cube with a side length of 2 inches:</p> $\text{Volume } V_2 = 2^3 = 8$ <p>cubic inches Surface area $A_2 = 6 \times 2^2 = 24$ square inches We know the total cost for each cube: - Cost of the cube with side length 1 inch is \$1.30. - Cost of the cube with side length 2 inches is \$6.80. Let c be the cost per square inch of the cat and b be the cost per cubic inch of the concrete. We can set up the following system of equations based on the given costs:</p> $c \cdot A_1 + b \cdot V_1 = 1.30 \quad c \cdot A_2 + b \cdot V_2 = 6.80$ <p>Substituting the values of</p> $A_1, V_1, A_2, \text{ and } V_2: \quad c \cdot 6 + b \cdot 1 = 1.30 \quad c \cdot 24 + b \cdot 8 = \span style="border: 1px solid black; padding: 0 2px;">6.80 \text{(Equ$