

Three Consecutive Integers Have A Sum Of 87. Find The Integers.

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Understanding how to find three consecutive integers that sum up to a specific number, such as 87, is a common algebraic problem that combines basic number theory with simple algebraic techniques. This problem not only enhances your problem-solving skills but also deepens your understanding of how consecutive numbers relate to each other mathematically. In this comprehensive guide, we will explore the step-by-step methods to determine these integers, discuss related concepts, and provide tips for solving similar problems efficiently. Whether you're a student preparing for exams or an enthusiast interested in number puzzles, this article aims to provide clear, detailed explanations to help you master the topic.

Understanding the Problem

Before jumping into solving the problem, it's essential to understand what is being asked:

- Given: The sum of three integers is 87.
- Find: The three integers, which are consecutive (meaning each number differs by 1).

Key concepts to clarify:

- Consecutive integers: Numbers following one after another, such as 4, 5, 6 or 10, 11, 12.
 - Sum of integers: The total obtained by adding the integers together.
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Mathematical Representation of Consecutive Integers

To solve the problem algebraically, it helps to represent the three consecutive integers using variables:

- Let the smallest of the three integers be n .
- Then, the next two integers are $n + 1$ and $n + 2$.

This notation allows us to express the problem mathematically and set up an equation based on the sum condition.

Formulating the Equation

Given the three consecutive integers:

- First integer: n
- Second integer: $n + 1$
- Third integer: $n + 2$

Their sum is given as 87, so:

$$n + (n + 1) + (n + 2) = 87$$

Simplify the left side:

$$n + n + 1 + n + 2 = 87$$

$$3n + 3 = 87$$

Now, solve for n :

$$3n = 87 - 3$$

$$3n = 84$$

$$n = \frac{84}{3}$$

$$n = 28$$

Thus, the smallest integer is 28.

Finding the Consecutive Integers

Now that we know $n = 28$, the three consecutive integers are:

- First integer: 28
- Second integer: $28 + 1 = 29$
- Third integer: $28 + 2 = 30$

Answer: The three integers are 28, 29, and 30.

Verification of the Solution

Always verify your solution by checking if the sum matches the given total:

$$\backslash [28 + 29 + 30 = 87 \backslash]$$

Calculating:

$$\backslash [28 + 29 = 57 \backslash]$$

$$\backslash [57 + 30 = 87 \backslash]$$

Since the sum is indeed 87, the solution is verified.

Alternative Approaches to Find the Integers

While the algebraic method is straightforward, there are alternative strategies to approach this problem:

1. Using Average Method

- Find the average of the three numbers:

$$\backslash [\frac{\text{sum}}{3} = \frac{87}{3} = 29 \backslash]$$

- For three consecutive integers, the middle number is the average:

$$\backslash [\text{Middle integer} = 29 \backslash]$$

- The integers are:

$$\backslash [29 - 1 = 28, \quad 29, \quad 29 + 1 = 30 \backslash]$$

This confirms the previous solution.

2. Trial and Error Method

- Start with a reasonable guess, such as 28, and verify:

$$\backslash [28 + 29 + 30 = 87 \backslash]$$

- Adjust the guess if necessary, but in this case, the initial guess directly leads to the correct integers.

Generalization of the Problem

Understanding this problem allows us to generalize it to similar problems involving consecutive integers and sums:

- How to find n consecutive integers with a given sum?
- What if the integers are not necessarily consecutive but follow a pattern?
- Solving for different sums or different sets of integers.

Key Steps to Solve Similar Problems

When approaching problems involving consecutive integers with a specified sum, follow these steps:

1. Define variables: Assign a variable to the smallest or middle integer.
2. Express other integers: Use the variable to express the remaining integers based on the pattern.
3. Set up the equation: Use the sum condition to form an algebraic equation.
4. Solve for the variable: Simplify and solve the equation.
5. Find the integers: Plug the value back into the expressions to find all integers.
6. Verify: Sum the integers to ensure the solution matches the given total.

Common Mistakes to Avoid

- Incorrect variable assignment: Ensure the variables correctly represent the pattern.
- Forgetting to verify: Always check the sum after finding the integers.
- Misinterpreting the problem: Confirm that the integers are indeed consecutive.
- Arithmetic errors: Double-check calculations, especially during algebraic simplification.

Practical Applications of Finding Consecutive Integers

The skill of solving problems involving consecutive integers is useful in various real-world and academic contexts:

- Number puzzles and brain teasers
- Financial calculations: Distributing amounts evenly over consecutive periods

- Programming challenges: Algorithms involving sequences
- Mathematical competitions: Developing problem-solving strategies
- Statistics: Grouping data points with consecutive labels

Conclusion

Finding three consecutive integers that sum to 87 is a straightforward problem that exemplifies how algebra can be applied to number patterns. By representing the integers with a variable, setting up an equation, and solving systematically, you can efficiently determine the integers. In this case, the integers are 28, 29, and 30. This approach not only provides a clear solution but also offers a template for solving similar problems involving consecutive numbers and sums. Mastery of this technique enhances your mathematical reasoning and prepares you for more complex algebraic challenges.

Additional Practice Questions

To reinforce your understanding, try solving these similar problems:

- Find three consecutive integers whose sum is 93.
- Determine four consecutive integers with a total sum of 202.
- Find three integers, not necessarily consecutive, that sum to 87, where the second integer is twice the first.

Practicing these variations will deepen your grasp of the concepts discussed and improve your problem-solving skills.

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Frequently Asked Questions

How do you set up an equation to find three consecutive integers with a sum of 87?

Let the first integer be x . Then the next two are $x+1$ and $x+2$. Set up the equation: $x + (x+1) + (x+2) = 87$, then solve for x .

What are the steps to find the three consecutive integers whose sum is 87?

First, write the equation $x + (x+1) + (x+2) = 87$. Simplify to $3x + 3 = 87$. Then, subtract 3 from both sides: $3x = 84$. Divide both sides by 3: $x = 28$. The integers are 28, 29, and 30.

Can the three integers be negative if their sum is 87?

No, since the sum is positive and relatively large, the three consecutive integers are positive numbers. Negative integers would sum to a negative or smaller number, not 87.

What is the significance of using consecutive integers in solving this problem?

Using consecutive integers simplifies the problem because each integer differs by 1, allowing us to set up a straightforward algebraic equation to find the solution.

If the sum of three consecutive integers is 87, what are the integers?

The integers are 28, 29, and 30.

How can this problem be generalized for any three consecutive integers with a given sum?

Let the first integer be x ; then, the sum is $3x + 3$. Set this equal to the given sum and solve for x to find the integers.

What common mistakes should be avoided when solving this type of problem?

Avoid mislabeling variables, forgetting to include all three integers in the sum, or making algebraic errors when simplifying the equation.

How does understanding the pattern of consecutive integers help in solving similar problems?

Recognizing that each integer differs by 1 allows you to set up simple algebraic equations, making it easier to quickly find solutions for sums or other conditions.

Is there an alternative method to find the three integers besides algebra?

While algebra is the most straightforward method, you could also use systematic trial and error or logical reasoning based on the average of the integers, but algebra provides a precise and efficient solution.

Additional Resources

Three Consecutive Integers Have A Sum Of 87. Find The Integers. This problem is a classic example of algebraic reasoning and number sense that often appears in math coursework or standardized tests. Understanding how to approach such problems enhances problem-solving skills and deepens comprehension of basic algebraic concepts. In this guide, we will walk through the step-by-step process to find the three consecutive integers that add up to 87, providing a detailed explanation suitable for students, educators, and math enthusiasts alike.

Understanding the Problem

Before jumping into calculations, it's important to clearly understand what the problem is asking:

- Given: Three consecutive integers.
- Sum of these integers: 87.
- Objective: Find the actual integers.

Consecutive integers are numbers that follow one after the other without any gaps. For example, 4, 5, 6 are consecutive integers, as are -2, -1, 0, or 10, 11, 12.

Step 1: Assign Variables to the Consecutive Integers

To solve the problem systematically, we assign variables to the integers:

- Let the first integer be n .
- Since the integers are consecutive, the next two are $n + 1$ and $n + 2$.

This approach simplifies the problem into an algebraic equation because the pattern is expressed in terms of a single variable n .

Step 2: Set Up the Equation Based on the Sum

According to the problem, the sum of these three integers is 87. Therefore:

$$n + (n + 1) + (n + 2) = 87$$

This equation represents the total sum of the three consecutive integers.

Step 3: Simplify and Solve the Equation

Now, combine like terms:

$$n + n + 1 + n + 2 = 87$$

$$3n + 3 = 87$$

Next, isolate n :

$$3n = 87 - 3$$

$$3n = 84$$

$$n = \frac{84}{3}$$

$$n = 28$$

So, the first integer is 28.

Step 4: Find the Remaining Integers

Since the integers are consecutive, the next two are:

$$n + 1 = 28 + 1 = 29$$

$$n + 2 = 28 + 2 = 30$$

Answer: The three consecutive integers that sum to 87 are 28, 29, and 30.

Verification: Confirm the Sum

To ensure the solution is correct, verify the sum:

$$28 + 29 + 30 = 87$$

Indeed, the total is 87, confirming our solution.

Additional Insights and Variations

What If the Sum Were Different?

Suppose the sum were a different number, say 90. The same approach applies:

- Set variables: $(n, n+1, n+2)$
- Form the equation: $n + (n+1) + (n+2) = \text{new sum}$
- Simplify and solve for n .

Handling Negative or Zero Values

- The same process works whether the integers are positive, negative, or include zero.
- For example, if the sum is 3, the integers might be -1, 0, and 1, since $(-1 + 0 + 1 = 0)$, so for sum 3, the integers would be different.

General Form of the Solution

For any sum (S) :

$$\begin{aligned} &[\\ &n + (n+1) + (n+2) = S \\ &] \\ &[\\ &3n + 3 = S \\ &] \\ &[\\ &n = \frac{S - 3}{3} \\ &] \end{aligned}$$

Once n is found, the three integers are:

$$\begin{aligned} &[\\ &n, n+1, n+2 \\ &] \end{aligned}$$

Practical Tips for Solving Similar Problems

1. Define Variables Clearly: Assign variables to the integers to facilitate algebraic manipulation.
2. Express the Pattern: Use the property of consecutive numbers to write the second and third integers in terms of the first.
3. Set Up the Equation: Use the given sum or other conditions to form an algebraic equation.
4. Simplify and Solve: Carefully combine like terms and isolate the variable.
5. Check Your Work: Substitute the found integers back into the original condition to verify.

Common Mistakes to Avoid

- Mislabeling the variables: Confusing the variables or not correctly setting up the consecutive pattern.
- Forgetting to verify the solution: Always double-check by summing the integers.
- Overcomplicating the problem: Recognize the pattern; for many problems involving consecutive integers, a straightforward algebraic approach suffices.

Summary

Three consecutive integers have a sum of 87. Find the integers. By assigning variables and setting up an algebraic equation, we find:

- The first integer, 28.
- The subsequent integers, 29 and 30.

These integers satisfy the conditions, as their sum is indeed 87. This problem exemplifies fundamental algebraic techniques and the importance of understanding number patterns. Mastery of such problems builds a strong foundation for tackling more complex algebraic and number theory challenges.

In conclusion, approaching problems involving consecutive integers involves recognizing the pattern, translating it into an algebraic equation, and solving systematically. Whether the sum is positive, negative, or involves larger numbers, the same principles apply, making this a versatile and essential technique in mathematics.

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