Title of Paper: "CSI Method: Identifying Consecutive Sums Excluding Powers of 2"

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Abstract: This paper introduces the CSI (Consecutive Sum Identification) Method, a systematic approach for determining whether a positive integer, excluding powers of 2, can be expressed as a sum of consecutive integers. The CSI Method divides the process into two cases: odd and even numbers. For odd numbers, the method identifies two consecutive integers whose sum equals the number. For even numbers, it presents a structured way to determine a range of consecutive integers that sum to the given number. Detailed examples are provided to illustrate the application of the CSI Method.

1. Introduction

This paper proposes a systematic method for determining consecutive sums for positive integers, excluding powers of 2. This approach identifies whether an integer can be expressed as a sum of consecutive integers, which is valuable in number theory and its applications.

2. Methodology

2.1 Odd Numbers

For odd numbers:

• Express the number as \((2n + 1)\), where \((n)\) is a natural number.
• The consecutive sum will be \((n)\) and \((n + 1)\).

Example: For the number 15:
• Write 15 as \((2n + 1 = 15)\).
• To find \((n)\), subtract 1 from 15 and divide by 2: \(((15 - 1)/2 = 7)\).
• The consecutive numbers are 7 and 8 because \((7 + 8 = 15)\).

2.2 Even Numbers

For even numbers:

• Start by expressing the number as the product of a natural number and an odd number.
• Calculate \((m)\) by subtracting 1 from the odd number and dividing by 2.
• The consecutive sum will range from \((n - m)\) to \((n + m)\).
• If \((n - m)\) is negative, adjust the sequence to start from \((m - n + 1)\) and continue up to \((n + m)\).

Example: For the number 18:
• Express 18 as \((2 \times 9)\).
• Calculate \( m = (9 - 1)/2 = 4 \).
• Normally, the sequence would start at \( 2 - 4 = -2 \), which isn’t possible, so adjust it.
• The sequence starts \( 3 \) (since \( 4 - 2 + 1 = 3 \)) and continues up to \( 6 \).
• The consecutive numbers are \( 3, 4, 5, \) and \( 6 \), which sum to \( 18 \): \( 3 + 4 + 5 + 6 = 18 \).

3. Conclusion

The proposed method provides a systematic approach to finding consecutive sums for positive integers, excluding powers of 2. By addressing both odd and even numbers separately, this method simplifies the identification of consecutive sums, making it useful for various applications in number theory.