Goldbach's Conjecture's Proof

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Abstract **:** *Goldbach's Conjecture is one of the oldest and best-known and till now unsolved problem in number theory and all of mathematics. The purpose of this is to increase the understanding of the concepts in number theory. It was first posed by Christian Goldbach in a letter to Leonhard Euler. It states that : Every even integer greater than 2 can be expressed as a sum of two prime numbers. While proving it I have taken prime numbers as variables and after some operations on it, equated it with even integer greater than 2 in its basic form. It is said that the conjecture is often simple to state but difficult to solve.*

Keywords: *Even integer, Odd integer, Primes***.**

I. INTRODUCTION : Goldbach's Conjecture states that every integer greater than 2 can be expressed as the sum of two primes. Best efforts have been made to present the proof of the problem as simply as possible.

II. GOLDBACH'S CONJECTURE'S PROOF

Case 1 : When an even integer is expressed as the sum of odd primes (SAOUTER, 1998).

Let 'a' and 'b' be 2 odd prime numbers.

Let's add them

$a+b$ ……(1)

Subtract 2 from (1)

$a+b-2$

$=a-1+b-1$ ……(2)

Since, 'a' and 'b' are odd and $(odd-1=even)$. So, $(a-1=even)$ and $(b-1=even)$

From (2)

$(a-1)+(b-1)$

$even+even=even$

So , $a+b-2=even$ ……(3)

And every even positive integer can be expressed in form '4m'

Putting it in (3)

$a+b-2=4m$

$a+b=4m+2$

4m + 2 is also a form of even number

$a+b=4m+2$

where (a + b) is the sum of prime numbers and (4m + 2) is a even integer greater than 2.

Case 2 : When an even integer is expressed as the sum of even prime numbers (RICHSTEIN, 2000).

There is only one even prime number that is 2.

So, sum of even primes

$$2+2=4$$

Hence, there is only one even number greater than 2, i.e., 4 which can be expressed as the sum of even primes.

Acknowledgement : I dedicate my work to my parents Mr. Mrityunjoy Roy and Mrs. Kakali Roy who have helped and encouraged me greatly . I also thank my respected teacher and mentor Mrs. Archana Barbudhe, teacher from St. Xavier's High School, Gondia, who has always supported and encouraged me to do well.

Conclusion : According to the Goldbach's Conjecture, any even number > 2 can be written as a sum of 2 primes. If 'a' and 'b' are prime numbers, then, $a+b=2n$ where, 'n' is greater than 1. Only 4 can be written as a sum of even primes, i.e., $4=2+2$ (2 is the only even prime number).

References :

[1] Richstein, j. (2000). *Mathematics of computation , 70* (236), 1745{1749.

[2] Saouter, y. (1998). Checking the odd goldbach conjecture up to 1020. *Mathematics of computation , 67* (222), 863{866.