

## PROOF OF GOLDBACH CONJECTURE

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### ABSTRACT

This paper through the creation of "double rectangular coordinate system", within the I quadrants, each coordinate axis coordinates all constitute the infinite sets. Coordinates with infinite sets one to one correspondence between the elements within and equal relationships. With any of the sum of two odd prime Numbers ( $a + b$ ) to form a square area, length for square of a square area  $A1$  "square" diagonal integration method, a quarter of a square area  $A1$  equation is derived with the definite integral equation;  $A1$  area value of the argument as infinite generalized integral value, and deduce the equations, the Goldbach conjecture.

### 1. INTRODUCTION

The content of the Goldbach conjecture:

- Any even number greater than or equal to 6 can be expressed as the sum of two odd prime Numbers.
- Any odd integer greater than or equal to 9 can be expressed as the sum of three odd primeNumbers.

This is the Goldbach conjecture.

Proof: Goldbach conjecture expressed equations as follows:

(a)  $2n = a + b$

(b)  $2n - 1 = a + b + c$

Equation  $2n = a + b$  must satisfy the following conditions:

Firstly, the  $n$  is greater than or equal to 3 any element of the set of natural Numbers is infinite.

Set:  $n \geq 3$  natural Numbers or infinite collection of symbols for  $2n \in 2(N+3)$ ,  $n \in n + 3$ .

Second:  $a, b$  is odd primes infinite any two elements in the collection.  $a$  and  $b$  in the odd primes within the infinite set arbitrary values.

Set: odd primes infinite collection of symbols for "Jss",  $a \in Jss$ ,  $b \in Jss$

Equations:  $2n = a + b$  satisfies conditions:  $a \in Jss$ ,  $b \in Jss$ ,  $a \geq 3$  or higher or  $3 \leq b$ ,

$N \in n + 3$ ,  $n \in \{3, 4, 5, \dots\}$ ,  $2 \in N$  ( $N + 2 \geq 3$ ), conform to any an even number greater than or equal to 6 can be expressed as the sum of two odd prime Numbers.

Equation (b)  $2n - 1 = a + b + c$  conditions must be satisfied:

Firstly, the  $n$  is greater than or equal to 5 infinite any one element of a set of natural Numbers.

Set:  $n \geq 5$  natural Numbers is infinite collection of symbols for " $n + 5$ ";

$N \in n + 5$

Second:  $a, b, c$  are odd prime Numbers is infinite any three elements in the collection,  $a, b, c$  in odd primes infinite set arbitrary values.

Set odd primes infinite sets symbol for "Jss"

$A \in J_{ss}, b \in J_{ss}, c \in J_{ss}$

Equations, (b)  $(2n - 1 = a + b + c)$  conditions must be satisfied:

$A \geq 3$  or higher,  $b \geq 3$  or higher,  $c \geq 3$  or higher;  $A \in J_{ss}, b \in J_{ss}$

$C \in J_{ss}, n \in n + \geq 5, n \in \{5, 6, 7, 8, \dots\}$ , conform to any odd integer greater than or equal to 9, can be expressed as the sum of three odd prime Numbers.

**2. Prove Goldbach conjecture:** create a new "double rectangular coordinate system is shown in figure 1.

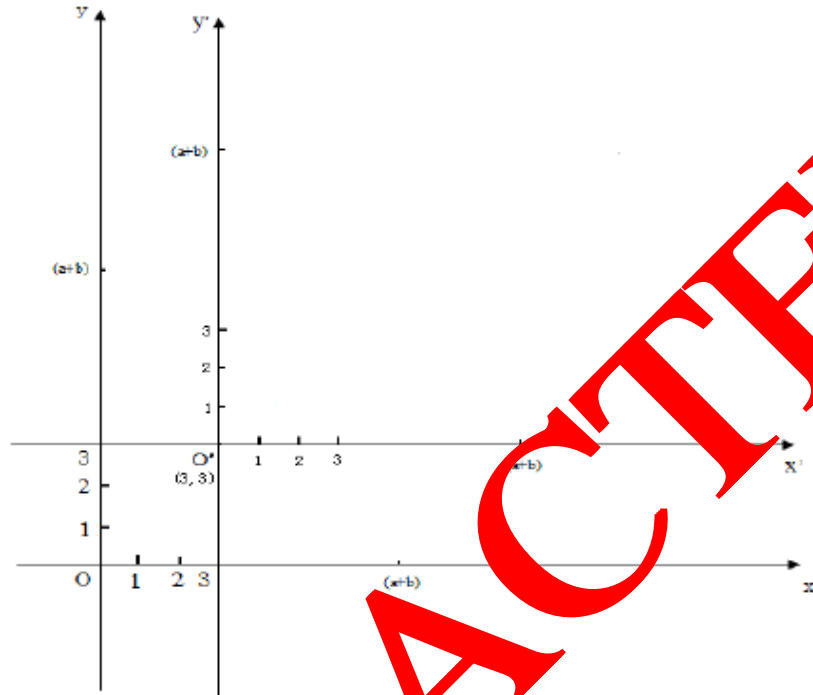


Figure-1

### 2.1 Double rectangular coordinate system construction steps:

1, based on the original  $xoy$  Cartesian coordinate system

2, OS  $x$  axial  $oy$  axis vertical horizontal move to the position of the odd prime number 3

3,  $oy$  axial OS  $x$  axis direction perpendicular to the horizontal displacement to the position of the odd prime number 3

4, OS  $x$  axis and  $oy$  axis perpendicular intersection in the origin of the new position of the odd prime

number 3, in the original coordinates  $xoy$  within the first quadrant, established a new coordinate system  $x', o', y'$

$Xoy$  is the original coordinate system and the new coordinate system  $x', o', y'$ , both together constitute a "double rectangular coordinate system", as shown in figure 1.

### 2.2 in double first quadrant in the rectangular coordinate system, the axes of the coordinate values and the relationship between the corresponding collections, meet such as under the given conditions:

1, on the OS  $x$  axis and  $oy$  shaft:

There is one-to-one correspondence and equal by all the natural Numbers for infinite sets of elements. As "N". There is a one-to-one correspondence and equal infinite set by all the even number of elements. As " $2n$  left". There is a one-to-one correspondence and equal by all the prime Numbers is infinite sets of elements. As "Ss".

2, in  $o, x$  and  $o, y'$  shaft: There is a one-to-one correspondence and equal by natural number (positive integer) is greater than or equal to 3 for infinite sets of elements. As  $N + 3$  or more or  $(Z +$

3 or higher) There is one-to-one correspondence and equal by all the odd prime number for the infinite sets of elements. Remember to make "the Jss" There is a one-to-one correspondence and equal by any of the sum of two odd prime Numbers (a + b) for the infinite sets of elements. As "2 (N+ 3 or higher)" There is one-to-one correspondence and equal by three odd prime number (a + b + c) is greater than or equal to the sum of nine odd for infinite sets of elements. As "Js 9 or higher. There is a one-to-one correspondence and equal by the sum of any three odd prime, plus 1, (a + b + c + 1) for the infinite sets of elements. As "2

**2.3 Within the I quadrant, the coordinate values with an infinite set of relationships between elements known to satisfy the following conditions:**

1, the coordinate values on each axis, with its corresponding one to one correspondence between infinite sets of elements and equal relationship. Axes coordinate values of the geometry the performance of a zero dimensional "points".

2, any of the sum of two odd prime Numbers (a + b) on each axis of coordinate with the corresponding infinite collection there is one-to-one correspondence between the elements within and equal relationship. (a + b) on the axis of coordinates of the geometric figure show the onedimensional"line".

3, in the x 'o, y', (a + b) to a side length of square area, with any (a + b) is a side length of square area, there is a one-to-one correspondence and equal relationship, with can form an infinite set of an element. (a + b) for the length of the square of the geometric figure is shown as a twodimensional "face".

**2.4 Within I quadrant, with any of the sum of two odd prime Numbers for a square side length (a + b), consisting of a square area A, a function of equation is derived.**

∴ a ∈ Jss ; b ∈ Jss a ≥ 3 b ≥ 3; known: x = (a + b), y = (a + b); Function: y = x; A = 2S1 ; (a+b) ≥ 6; (a + b) ∈ 2 (N<sup>+</sup>≥3);

As A special curved trapezoid area y = x in [0, (a + b)] on integrable. In x axis on [0, (a + b)], by y = (a + b) and x axis and y = x of a right triangle S1 in y axis on [0, (a + b)], composed of x = (a + b), and y = x and y axis right triangle S2 of side length for (a + b) a. square area (square area a is equal to 2 times the right triangle area of S1).

A= S<sub>1</sub> +S<sub>2</sub>;

According to Newton, Leibniz formula:

If the function f (x) continuous on [a, b], and there is the function f (x), then f (x) integrable on [a, b], and Borel or limit (lower limit) f (x) dx = f (b) - (a) f

Launch function y = x in [0, (a + b)] on continuously, and the function F (x) = x<sup>2</sup>/2, the function y = x in [0, (a + b)] on integrable, S<sub>1</sub>=∫<sub>0</sub><sup>(a+b)</sup> xdx =x<sup>2</sup>/2=1/2(a+b)<sup>2</sup>

∴ with definite integral is expressed as A: A=2S<sub>1</sub>; A=2∫<sub>0</sub><sup>(a+b)</sup> xdx = (a+b)<sup>2</sup>

Proof: in [0, +∞), A generalized integral for infinite range of values.

Proof:

Known:

1, y = x is the elementary function, define the interval [0, +∞) for continuous function, meet the function continuous condition.

2, a ∈ Jss , b ∈ Jss , a ≥ 3 , b ≥ 3 ; y=x function F(x)=1/2(x)<sup>2</sup>

(a+b) ≥ 6 , (a+b) ∈ 2(N<sup>+</sup> ≥ 3) ; By y = (a + b), x = (a + b) and y = x of a right triangle S1 of the generalized integral,

$F(x) = 1/2 x^2$  is an antiderivative of  $y = x$ ,

$$\int_0^{+\infty} x dx = \lim_{(a+b) \rightarrow +\infty} \int_0^{(a+b)} x dx = \lim_{x \rightarrow +\infty} (X^2/2) = \lim_{(a+b) \rightarrow +\infty} 1/2(a+b)^2$$

$$S_1 = 1/2(a+b)^2$$

$$A = 2S_1;$$

$$2 \int_0^{+\infty} x dx = \lim_{(a+b) \rightarrow +\infty} \int_0^{+\infty} 2x dx = \lim_{x \rightarrow +\infty} 2[X^2/2] = \lim_{(a+b) \rightarrow +\infty} 2[(a+b)^2/2] = (a+b)^2$$

$$A = (a+b)^2$$

Conclusion 1:

In any of the sum of two odd prime Numbers  $(a + b)$  to the area of the side length of square  $a$  is of value as the limit of infinite generalized integral, as shown in figure 2

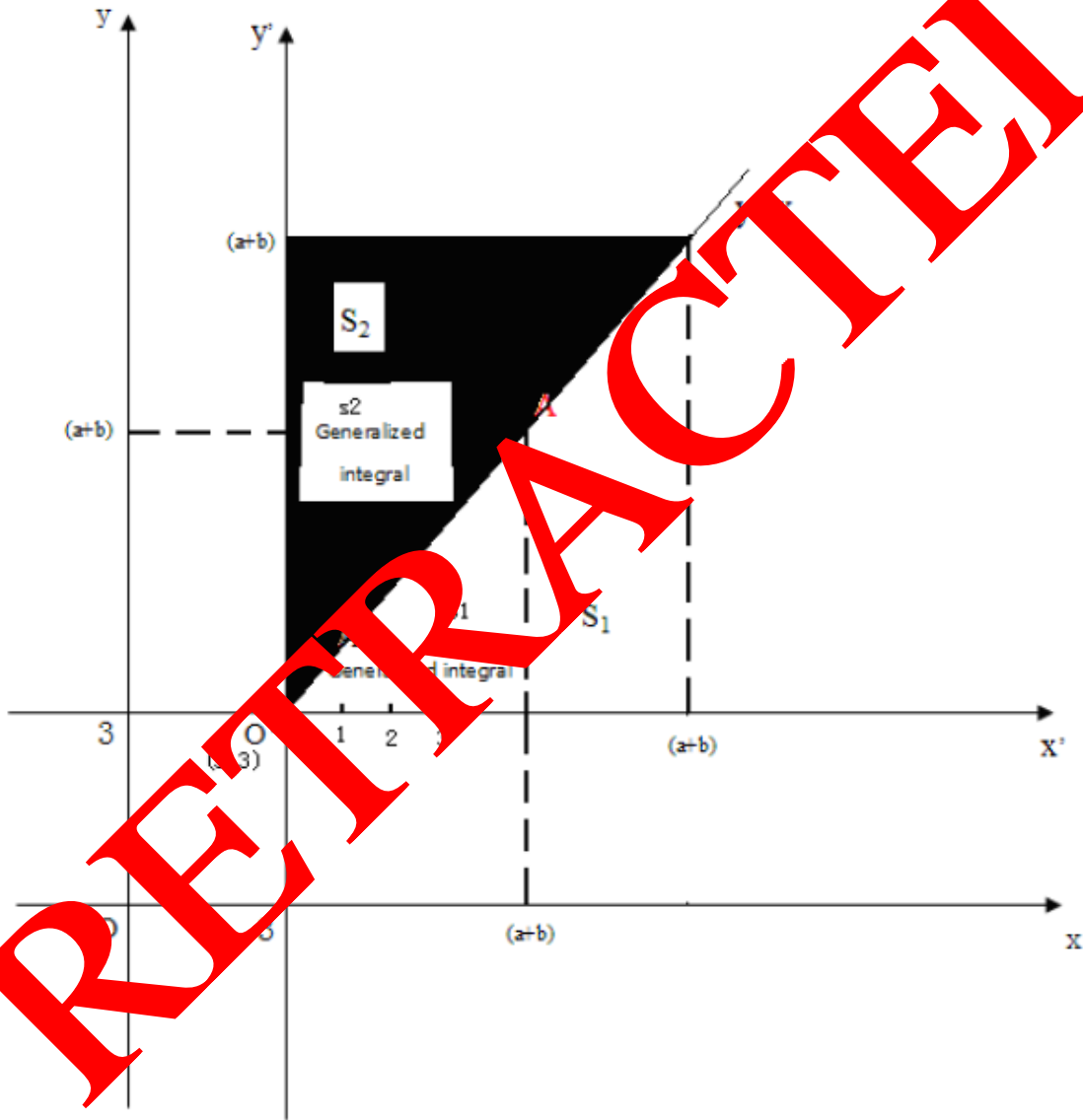


Figure-2

2.5 Within I quadrant to  $(a + b) / 2$  is a side length of the midpoint coordinates, the  $a$  is divided into four small Square area (see figure 3),

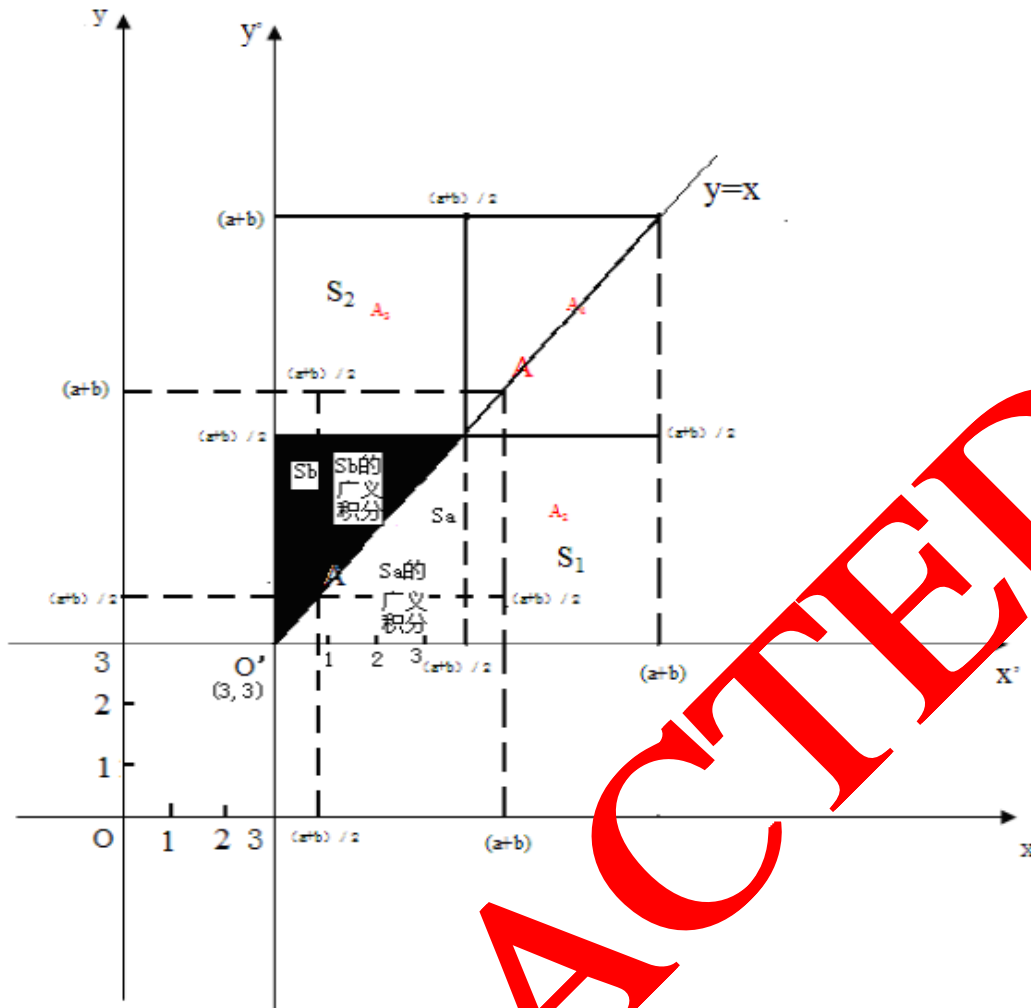


Figure-3

Make the  $A_1 = A_2 = A_3 = A_4 =$  square area  $A_1$  equations is derived.  
 $y = (a+b)/2$ ;

$$X = (a+b)/2; y = x, A_1 = 2S_a = S_b,$$

$a \in \mathbb{J}_{ss}, b \in \mathbb{J}_{ss}, a \geq 3, b \geq 3, (a+b) \geq 6, (a+b)/2 \geq 3, (a+b)/2 \in \mathbb{N}^+ \geq 3$

See  $A_1$  as a special curved trapezoid area,  $y = x$  in the interval  $[0, (a+b)/2]$  on integrable,  $A_1$  expressed in definite integrals:

$$A_1 = S_a = \int_0^{(a+b)/2} x dx = 1/2[(a+b)/2]^2;$$

$$A_1 = 2 \int_0^{(a+b)/2} x dx = [(a+b)/2]^2$$

Proof: in  $[0, +\infty)$ ,  $A_1$  as the limit of infinite generalized integral.

Proof:

Known:

1,  $y = x$  is the elementary function, define the interval  $[0, +\infty)$  for continuous function, meet the function continuous condition.

2.  $a \in \mathbb{J}_{ss}, b \in \mathbb{J}_{ss}, a \geq 3, b \geq 3; y = (a+b)/2$ ;

$$X = (a+b)/2; y = x; A_1 = 2S_a; S_a = S_b;$$

$$(a+b) \geq 6, (a+b)/2 \geq 3, (a+b)/2 \in \mathbb{N}^+ \geq 3$$

$Y = x$  function  $F(x) = 1/2(a+b)$  [2/2; 2 times the value of the function  $2 \cdot 1/2(a+b)$  [2/2 is 9 or more constant

( $\lim C = C$ ); By  $y = (a+b)/2$ ,  $x = (a+b)/2$ , and  $y = x$  of a right triangle  $S_a$  generalized integral; Function  $y = x$  in  $[0, +\infty)$  on the generalized integral. Remember to:

$$\int_0^{+\infty} x dx = \lim_{(a+b)/2 \rightarrow +\infty} \int_0^{(a+b)/2} x dx = \lim_{x \rightarrow +\infty} (X^2/2) = \lim_{(a+b) \rightarrow +\infty} 1/2[(a+b)/2]^2$$

$$S_a = 1/2[(a+b)/2]^2$$

$$A_1 = 2S_a$$

$$2 \int_0^{+\infty} x dx = \lim_{(a+b)/2 \rightarrow +\infty} \int_0^{(a+b)/2} 2x dx = \lim_{x \rightarrow +\infty} [2(X^2/2)] = \lim_{(a+b) \rightarrow +\infty} 2[(a+b)/2]^2/2$$

$$A_1 = [(a+b)/2]^2$$

$$\text{Launch of equations: } 2\sqrt{A_1} = a + b$$

Corollary 1:

Any of the sum of two odd prime Numbers  $(a + b)$  is equal to that the sum of two odd prime Numbers  $(a + b)$  for a quarter of a square a square of side length 2 times.

Corollary 2:

Any the sum of two odd prime Numbers  $(a + b)$  is equal to that the sum of two odd prime Numbers  $(a + b)$  for a quarter of a square of side length area  $A_1$  generalized integral value of the square root of 2 times.

Launch:

$2\sqrt{A_1} = a + b$  Meet the known conditions:

$$\sqrt{A_1} = (a+b)/2;$$

$$a \in \mathbb{Jss}, b \in \mathbb{Jss}, a \geq 3, b \geq 3$$

$$(a + b) \geq 6, (a + b)/2 \geq 3,$$

$$(a + b)/2 \in \mathbb{N}^+ \geq 3$$

(1)  $y = x$  In  $[0, +\infty)$  integrable, generalized integral of  $S_a$  for infinite range of integration,  $\sqrt{A_1} = (a+b)/2$ ,  $\sqrt{A_1} \in (\mathbb{N}^+ \geq 3)$  exist by  $A_1 \in \mathbb{N}^+$  for the elements of infinite sets, this infinite set of  $A_1$  elements (2) a quarter of a square area  $A_1$  generalized integral value of the square root of 2 times) and  $2(\mathbb{N} + 3)$  or more of the elements within the one and the same.

(2)  $2\sqrt{A_1} \in 2(\mathbb{N}^+ \geq 3)$ , Within I quadrant,  $A_1, 2)$  and  $2(\mathbb{N} + 3)$  or more elements exist within the infinite sets one-to-one corresponding and equal relationship.

$2\sqrt{A_1} = a + b$  To prove  $\sqrt{A_1}$  Any even number greater than or equal to 6 can be expressed as the sum of two odd prime Numbers  $(a + b)$ .

Therefore Goldbach conjecture (a).

**2.6 in the same way to prove: Within the I quadrant, any odd integer greater than or equal to 9, can be expressed as the sum of three odd prime number  $(a + b + c)$**

1,  $(a + b + c + 1)$  is derived equations for a side length of square area.

Take A look at as A special curved trapezoid,  $y = x$  in the interval  $[0, +1)$   $(A + b + c)$  on integrable, The known conditions:

$$A = 2S_1; a \geq 3, b \geq 3, c \geq 3, a \in \mathbb{Jss}, b \in \mathbb{Jss}, c \in \mathbb{Jss}, (a+b+c) \geq 9, (a+b+c+1) \geq 10; (a+b+c+1) \in 2(\mathbb{N}^+ \geq 5), y = (a+b+c+1); x = (a+b+c+1); y = x; A = S_1 + S_2$$

A With definite integral is expressed as:

$$A = 2S_1; S_1 = \int_0^{(a+b+c+1)} x dx = 1/2(a+b+c+1)^2,$$

$$A = 2 \int_0^{(a+b+c+1)} x dx = (a+b+c+1)^2$$



Because of the  $2\sqrt{A_1} - 1 = (a + b + c)$  Meet the known conditions:  $\sqrt{A_1} = (a+b+c+1)/2$ ,  
 $a \in \mathbb{J}_{\geq 3}$ ,  $b \in \mathbb{J}_{\geq 3}$ ,  $c \in \mathbb{J}_{\geq 3}$ ,  $a \geq 3$ ,  $b \geq 3$ ,  $c \geq 3$ ,  
 $(a + b + c) \geq 9$ ,  $(a+b+c+1)/2 \geq 5$ ,  $(a+b+c+1)/2 \in \mathbb{N}^+ \geq 5$

(1)  $y = x \ln [0, +\infty)$  is integral and the  $S_a$  for an improper integral, there by  $A_1-1$  (2) for the element of infinite sets, this infinite set of elements (a quarter of a square area  $A_1$  generalized integral value of the square root of  $2x$  minus 1)  
 Elements within a "Js 9 or higher" one to one correspondence and be equal.

(2)  $(2\sqrt{A_1} - 1) \in \mathbb{J}_{\geq 9}$  Within the I quadrant  $(2\sqrt{A_1} - 1)$  and  $\mathbb{J}_{\geq 9}$  Infinite elements within a collection There is a one-to-one correspondence and equal relationship  $2\sqrt{A_1} - 1 = (a+b+c)$  To prove  $(2\sqrt{A_1} - 1)$  Is any odd number greater than or equal to 9 can be expressed as the sum of three odd prime Numbers  $(a + b + c)$ . Therefore, Goldbach conjecture (b).

Conclusion Goldbach conjecture proposed since 1742, more mathematicians published almost primes, exceptions to the rule set, such as three prime number theorem proof methods, this paper gives the create double rectangular coordinate system, using any two or three, the sum of a prime number  $(a + b)/(a + b + c)$  side to form a square with an area of  $a$  or a quarter of a square area  $A_1$  "square" diagonal integral method, derive the equations  
 $2\sqrt{A_1} = (a+b)$ ;  $(2\sqrt{A_1} - 1) = (a+b+c)$ ;

This proved that the innovation of the Goldbach conjecture.

#### Author's brief introduction:

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