Proof of the Goldbach's Conjecture (First Landau's Problem)

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1 Definition of the Goldbach's Conjecture

<u>Definition:</u> Each even number (x) can be represented as a sum of two primes (y_o).
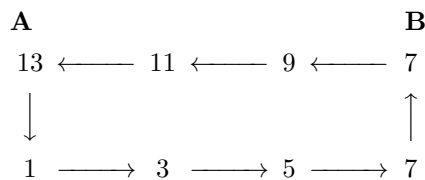
2 Algorithm for Proof of the Goldbach's Conjecture
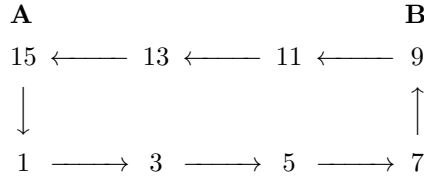
2.1 Chains of Odd Numbers

Sequence of even numbers $\{x\}$ is a sequence of chains of odd numbers y of the form $1 \leq y \leq (x-1)$, which are closed by the expression $1 + (x-1)$ from the side **A**. These chains are closed by the expression $(x/2) + (x/2)$ from the side **B** if $(x/2)$ is an odd number, otherwise - by the expression $((x/2) - 1) + ((x/2) + 1)$. The addition of mutually directed chain links gives the original even number x.
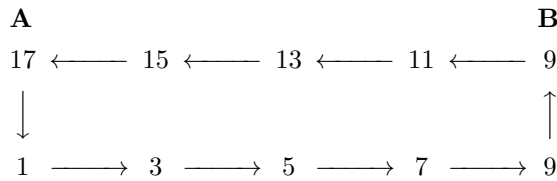
<u>Examples:</u>

For 14:

For 16:

$$
\begin{array}{ccccccc}
\mathbf{A} & & & & & & \mathbf{B} \\
15 & \longleftarrow & 13 & \longleftarrow & 11 & \longleftarrow & 9 \\
\downarrow & & & & & & \uparrow \\
1 & \longrightarrow & 3 & \longrightarrow & 5 & \longrightarrow & 7
\end{array}
$$

For 18:

$$
\begin{array}{ccccccccc}
\mathbf{A} & & & & & & & & \mathbf{B} \\
17 & \longleftarrow & 15 & \longleftarrow & 13 & \longleftarrow & 11 & \longleftarrow & 9 \\
\downarrow & & & & & & & & \uparrow \\
1 & \longrightarrow & 3 & \longrightarrow & 5 & \longrightarrow & 7 & \longrightarrow & 9
\end{array}
$$

2.2 Conclusion 1

Conclusion 1: Each new even number is a consecutive shift to one larger value in the expressions in the chain y with respect to a smaller value. A new links of the chain y appears when the expression $(x/2) + (x/2)$ appears on the side **B**.

2.3 New Definition of the Goldbach's Conjecture

New definition: Goldbach's Conjecture means that with each shift in the links of the chain y and the appearance of a new links of the chain there are always mutually directional chain links, where only the primes (y_o).

Half of the smaller values of the chain y are practically unchanged, only gradually added from the side of **B** by smaller values of the opposite half of the chain.
As the value of x increases, the fraction y_o decreases in both halves of the chain y, but especially at half the large values.

2.4 Formula of Disjoint Sets of Odd Numbers

The entire infinite sequence of odd numbers $\{y\}$ can be represented as disjoint sets.
Let the frequency of appearance of all odd numbers y - 100%. Then:

$$
\left(0{,}0\ldots 01\%(1) + 33{,}3\ldots 3\%(\{3y\}) + \sum_{n=3}^{n\to\infty} Z_{y_{on}}\left(\{y_{on}y_n \mid \frac{y_n}{3} \notin \mathbb{N}, \ldots, \frac{y_n}{y_{o(n-1)}} \notin \mathbb{N}\}\right)\right) \to 100\%,
$$

where: the number of digits represented by $(\ldots)$ in the first two terms $\to \infty$;

$\qquad n$ is the number of a member of a sequence of odd primes;

$\qquad y_n$ is a sequence of odd numbers with the conditions given in the formula;

$\qquad y_{o(n-1)}$ is the prime number in sequence of primes just before y_{on};

$\qquad Z_{y_{on}}$ is the frequency of appearance of the given set (in %) in the sequence $\{y\}$.

(1)

It is easy to see that the first term is y_o in all sets of the expression (1). The first terms of an infinite sequence of all sets are all $y_o \geq 3$.

The frequency of appearance of $Z_{y_{on}}$ (in percent) in the sequence $\{y\}$ is calculated easily:

The frequency of appearance of the set $\{3y\}$ by definition - $Z_3 = 33{,}3\ldots3\%$ (every third term in the sequence $\{y\}$).

The frequency of appearance of the total sum of known sets Σ_3 in the sequence $\{y\}$:

$$\Sigma_3 = 0{,}0\ldots01\% + 33{,}3\ldots3\% = 33{,}3\ldots4\%. \tag{2}$$

The frequency of appearance of all members of the set $\{3y\}$ from all odd numbers, multiples of 3, $R_3 = 100\%$.

Let's calculate R_5, the frequency of the appearance of the set $\{5y_5 \mid y_5/3 \notin \mathbb{N}\}$ from all odd numbers that are multiples of 5:

$$R_5 = 100\% - 33{,}3\ldots3\% = 66{,}6\ldots67\%, \tag{3}$$

that it is possible to present so:

$$R_5 = 100\% - (\Sigma_3 - 0{,}0\ldots01\%) = 66{,}6\ldots67\%. \tag{4}$$

Let's compute Z_5, the frequency of the appearance of the set $\{5y_5 \mid y_5/3 \notin \mathbb{N}\}$ in the sequence $\{y\}$:

$$Z_5 = \frac{R_5}{5} \approx 13{,}3\ldots3\%. \tag{5}$$

The frequency of appearance of the total sum of known sets Σ_5 in the sequence $\{y\}$:

$$\Sigma_5 = \Sigma_3 + Z_5 \approx 46{,}6\ldots67\%. \tag{6}$$

Expressions for Z_n, Σ_n, R_n in general form will be:

$$Z_{y_{on}} = \frac{R_{y_{on}}}{y_{on}}, \tag{7}$$

$$\Sigma_{y_{on}} = \Sigma_{y_{o(n-1)}} + Z_{y_{on}}, \tag{8}$$

$$R_{y_{on}} = 100\% - (\Sigma_{y_{o(n-1)}} - 0{,}0\ldots01\%), \tag{9}$$

$$R_{y_{on}} = Z_{y_{on}} y_{on} = Z_{y_{o(n-1)}}(y_{o(n-1)} - 1), \tag{10}$$

$$\frac{Z_{y_{o(n-1)}}}{Z_{y_{on}}} = \frac{y_{on}}{(y_{o(n-1)} - 1)}. \tag{11}$$

2.5 Final Conclusion on Goldbach's Conjecture

For $y_o = 8999$, the frequency of appearance of the total sum of known sets in the sequence $\{y\}$ $\Sigma_{8999} \approx 87{,}6726\%$, and $Z_{8999} \approx 0{,}0014\%$. Thus, the share of unknown sets, and among them the remainder unknowns y_{on}, is reduced to $\sim 12{,}3274\%$ (the share of y_{on}, naturally, is even lower).

However, no matter how the $\Sigma_{y_{on}}$ decreases with the growth of the value of y_{on} according to (9) and (10), the total sum of the known sets $\Sigma_{y_{on}}$ will eventually reach, for example, $\Sigma_{y_{on}} \approx 99\%$. This will happen because the entire infinite sequence of odd numbers $\{y\}$ consists of disjoint sets of odd numbers according to (1), but primes whose sets are formed in such a range are high-level numbers with a large number of digits. The share of unknown sets in this range, including those remaining by unknowns of y_{on}, is reduced to $\sim 1\%$.

If a prime number y_{on}, with $\Sigma_{y_{on}} \approx 99\%$ and $R_{y_{on}} \approx 1\%$, put on the side **B** of the chain y of the next even number x, then the frequency of appearance of a $y_o < 1\%$ in half the large values. The highest frequency of appearance of y_o is: the first four values in half the smaller values are y_o, the fraction y_o in the first set $\{n100\}$ of the sequence $\{y\}$ reaches 50%. The frequency of appearance of y_o becomes significantly less than 50% in half of the smaller values of the chains y of even numbers x with a large number of digits. In such a range of even

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numbers x , where the frequency of appearance of $y_o < 1\%$ in half of the large values of the chain y and the frequency of appearance of y_o is significantly less than 50% in half of the smaller values of the chain y, it is easy to achieve a state where $x \neq y_{o1} + y_{o2}$. This can be achieved by successively shifting the links of the chain y in half of large values and adding odd numbers of the opposite half from the side **B** to half of the smaller values.

Thus, **Goldbach's Conjecture** is not confirmed.

Publications: http://samlib.ru/editors/b/bezymjannyj_a/w1.shtml