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MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Practice and Understanding of the Goldbach Problem (A)

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Abstract Practice shows: Without enough parameters, 1+2 cannot estimate 1+1 and 1+1×1. At the same time, it is pointed out that among the prime numbers not greater than N, the prime number 6t-1 is more than the prime number 6t+1, (this is the "detail" that Hardy and the others did not notice.) "detail" (= "remainder") affects Represents the negligible oscillation in the accuracy curve of the number r2(N) of Hardy-Litttlewood conjecture (A) in 1921. (In 1989, Hua Luogeng (华罗庚) confirmed that conjecture (A) is the "main term" of even Goldbach's problem.)

[Tong Xinping(童信平)**Practice and Understanding of theGoldbachProblem(A)***AcademArena*2021;13(4):71-75]. ISSN1553-992X(print);ISSN2158-771X(online).http://www.sciencepub.net/academia. 7. doi:10.7537/marsaaj130421.07.

Keywords: Practice; Understanding; Goldbach; Problem

In 1977, from a logical and philosophical point of view, I thought that "1+2" could not reach "1+1" (short for even Goldbach conjecture). Starting from interest, I am determined to find mathematical evidence that "1+2" cannot reach "1+1" under the guidance of philosophical viewpoints. Seeing Xu Chi's article, I dare not act. However, the passion in my heart cannot be extinguished. After waiting for 4 years, in 1981, finally in some books, the Pan brothers said: "It is impossible to prove the proposition {1,1} by using Chen Jingrun's weighted sieve method." "The coefficient value of ('1+2'), It may be more than 2 to be valuable." Wang Yuan (王元) said: "It is impossible to prove (1,1) with the improvement of the current method." They partially admitted that Hardy said in 1921 that "Goldbach's conjecture does not seem to be able to use Brown's Method to prove". With these speeches, I can move forward, and under the encouragement of the spirit of "everyone is responsible", find a new way to relieve the Chinese people's pain of not being able to prove "1+1". I believe that we can use mathematical practice→knowledge, practice again→recognize again this magic weapon of crossing the river by touching the stones, complete the following three experimental verifications, and get a new understanding of "1+1".

1 The formula (Ca) is Chen Jingrun's "1+2". Practice shows: "1+2" lacks parameter 2 and cannot be used to calculate "1+1".

(Ca)

$$r_2(N) > 0.67c(N)\frac{N}{\ln^2 N}\prod\frac{p-1}{p-2} = 2c(N)\frac{N}{\ln^2 N}\prod\frac{p-1}{p-2}(1-0.665)。$$

The c(N) in the formula is represented c in the other book.

Wang Yuan said that to prove "1+1" is to prove (1+O(1))→1, which is the "remainder" O(1)→0. The -0.665 here is a definite value, not →0, and it cannot be called "remainder". This can be simply explained mathematically, what is calculated with "1+2" is not "1+1".

So, let's assume that the coefficient value is greater than 2.67, is it more useful? Please see the formula (Cb);

(Cb)

$$r_2(N) > 2.67c(N)\frac{N}{\ln^2 N}\prod\frac{p-1}{p-2} = 2c(N)\frac{N}{\ln^2 N}\prod\frac{p-1}{p-2}(1+0.335)$$

Here is 0.335, it is not → 0, and the more it is greater than 2, it is cannot → 0. ——Greater than 2 has no value.

On February 13, 1992, at the press conference of the Institute of Mathematics, Wang Yuan said to the media: "Chen Jingrun never proved 1+1, and never even thought that he could prove 1+1." Therefore, Chen Jingrun is want to prove "1+2", but he didn't to prove "1+1" in the past. How is it possible to get "1+1"?

2 Formula (Ⅲ) can calculate "1+1×1". Practice shows: "1+2" lacks parameters and cannot be used to calculate "1+1×1".

Figure 1 is the experimental accuracy curve of formula (Ⅲ) and formula (Ca).

(Ⅲ)

$$N(1,1\times 1)_m \sim \frac{2\pi(m)(\pi(N)-r+1)}{N}\prod\left(1-\frac{1}{(p-1)^2}\right)\prod\frac{p-1}{p-2}\ \Sigma$$

$\frac{(p-1)}{p(p-2)}$ +…

p ＞ 2

p|N p∤N

3≤p≤ √N 3≤p≤ √N 3≤p≤ √N

Figure 1 shows that within the experimental range, formula (III) is far more accurate than formula (Ca). The main reason is that the formula (Ca) has no parameter Σ (p-1)p(p-2). It can be seen that "1+2" = formula (Ca)≠ formula (III), "1+2" cannot be used to calculate "1+1×1".

The above analysis shows that "1+2" can contain "1+1" and "1+1×1". However, it cannot be said separately that "1+2" proves "1+1" or "1+1×1". Here, "1+2" can be compared to the compound water (=H2O) that can extinguish fire. We cannot separate H2O. Water is H2 (combustible) or O (combustion-supporting). More generally speaking, "1+2" is like Mr. Ouyang ×× in the surname of a hundred families. This surname contains the two characters Ou (equivalent to "1+1") Yang (equivalent to "1+1×1") , But if you call him Mr. Ou ("1+1") ×× or Mr. Yang ("1+1×1") ××, it is a kind of disrespect for him. Thinking that "1+2" is proof of "1+1" or "1+1×1", it is not understanding or disrespect of "1+2". "1+2" just selects some parameters shared by "1+1" and "1+1×1".

3 Through the gradual simplification of formula (3), Hardy's even Goldbach conjecture (formula (1a)) was obtained 100 years ago.

(3)

$$r_2(N) \sim [2\frac{\pi(N-p_r-1)(\pi(N)-r+1)}{N} \prod_{3\le p\le\sqrt{N}} (1-\frac{1}{(p-1)^2})] \prod_{\substack{p|N\\3\le p\le\sqrt{N}}} \frac{p-1}{p-2} (1-\frac{r}{\pi(N-p_r-1)})(1\pm\delta)$$

In formula (3), when N→∞, π(N- pr-1)→ π(N). π(N)-r-1→ π(N). r/(π(N)-r-1)→0, the formula (2) is obtained.

When the "remainder" ± δ is not included, formula (2) is the Hardy-Littlewood conjecture (A) in 1921.

(2)

$$r_2(N) \sim 2\frac{\pi^2(N)}{N} \prod (1-\frac{1}{(p-1)^2}) \prod \frac{p-1}{p-2} \quad (1\pm\delta)$$

According to the prime number theorem $\frac{\pi^2(N)}{N} \sim \frac{N}{\ln^2 N}$, Get formula (1)。

(1)

$$r_2(N) \sim 2\frac{N}{\ln^2 N} \prod (1-\frac{1}{(p-1)^2}) \prod \frac{p-1}{p-2} \quad (1\pm\delta)$$

In 1989, Hua Luogeng used "A Direct Attempt to Goldbach Problem" to proof his mentor Hardy conjecture (A) obtained by through hypotheses, further proving that the conjecture (A) is the "main term" of the even Goldbach conjecture. Therefore, what remains to be studied is the unresolved "remainder" ± δ, (Hardy called it "details" at the time.)

That prime numbers greater than 2 and 3 can be divided into: prime number p_-=6t-1 and prime number p_+=6t+1. In the N, the p_- is more and p_+ is less. Therefore, p_- and p_+ are the real parameters. If the N=6n-2=p_-+p_-, the number of answers is more. If the N=6n+2=p_++p_+, the number of answers is relatively small, If the N=6n=p_++p_- =6n, the number of answers is relatively small.

It can be seen that in the formula $\frac{\pi^2(N)}{N} \sim \frac{N}{\ln^2 N}$. It is a kind of "nominal value" or "indicated value", but the method of correction is also very simple. $\frac{\pi^2(N)}{N}(1\pm\delta) \sim \frac{N}{\ln^2 N}(1\pm\delta)$.

$$\text{(1a)} \quad r_2(N) \sim 1.3203\frac{N}{\ln^2 N} \prod \frac{p-1}{p-2} \quad (1\pm\delta)$$

Excluding δ, this is the simplified Hardy-Litwood conjecture (A) in the world.

"Science only recognizes the first, not the second." said Lu Bai, vice president of China R&D at GlaxoSmith.

Because "From the tolerance formula of Goldbach conjecture to Hardy-Littlewood conjecture (A)" may not be easy to understand. The following Table 1 is a comparison of the experimental accuracy of formulas (2) ,(3).

Table 1. In the formula (3), the existence of details of this ±δ

N	[0-N] test	Formula (2) count	For.(2) accurate	[p_r+1,N- p_r -1] test	Formula (3) count	For. (3) accurate	Details ±δ (1±δ) function
128	6	10.2	1.7	6	7.1377	1.1889	(1-δ)——can
256	16	15.3	0.9562	14	11.8173	0.8441	(1+δ)——can
512	22	24.5	1.1136	18	20.1775	1.1210	(1-δ)——can
1024	44	38.4	0.8727	38	32.7933	0.8630	(1+δ)——can
2048	50	61.8	1.236	44	56.5372	1.2849	(1-δ)——can
4096	106	102.8	0.9698	96	95.1456	1.0090	(1+δ)——no
8192	152	170.7	1.123	148	161.4751	1.0910	(1-δ)——can
16384	302	291.3	0.9646	296	280.3683	0.9472	(1+δ)——can
32768	488	497.4	1.1093	480	483.627	1.0076	(1-δ)——can
65536	870	862.7	0.9916	860	846.7056	0.9845	(1+δ)——can
131072	1498	1512.5	1.0097	1486	1491.7763	0.9702	(1-δ)——no
262144	2628	2666.9	1.0148	2596	2639.4874	1.0168	(1+δ)——no
524288	4734	4742.1	1.0017	4702	4708.6924	1.0014	(1-δ)——can
1048576	8478	8471.8	0.9994	8436	8430.3789	0.9993	(1+δ)——can
2097152	14942	15246.4	1.0204	14906	15193.2259	1.0193	(1-δ)——can
19999996	105832	106581.7	1.0071	105725	106446.351	1.0068	(1+δ)——no
24999998	129571	129506.8	0.9995	129461	129372.246	0.9993	(1-δ)——no
100000094	437445	438281.5	1.0019	437291	438075.599	1.0018	(1-δ)——can
		18 average	=1.0556		18 average	=1.0198	

Table 1 shows that in most cases, using detail ±δ correction can improve the accuracy. From a development perspective, when N→∞, the detail can be ignored. Table 1 and Figure 1 do not show specific values of δ.

From the average of 18 points, formula (3) is slightly more accurate than the formula. I wonder what everyone thinks?

Figure 2 shows the trend of the accuracy curves of formulas (1), (2) and (3). The arrow in the figure indicates an abnormality in the accuracy curve.

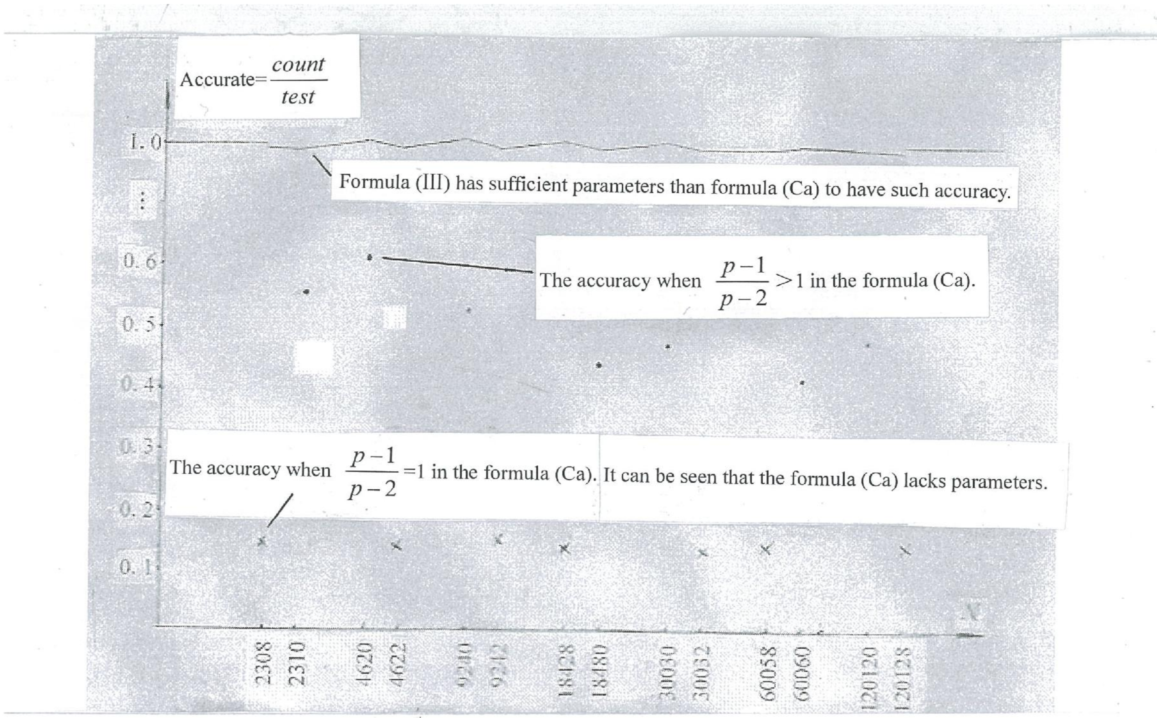

Figure 1 The formula (III) is accurate, but the formula (Ca) is not accurate.

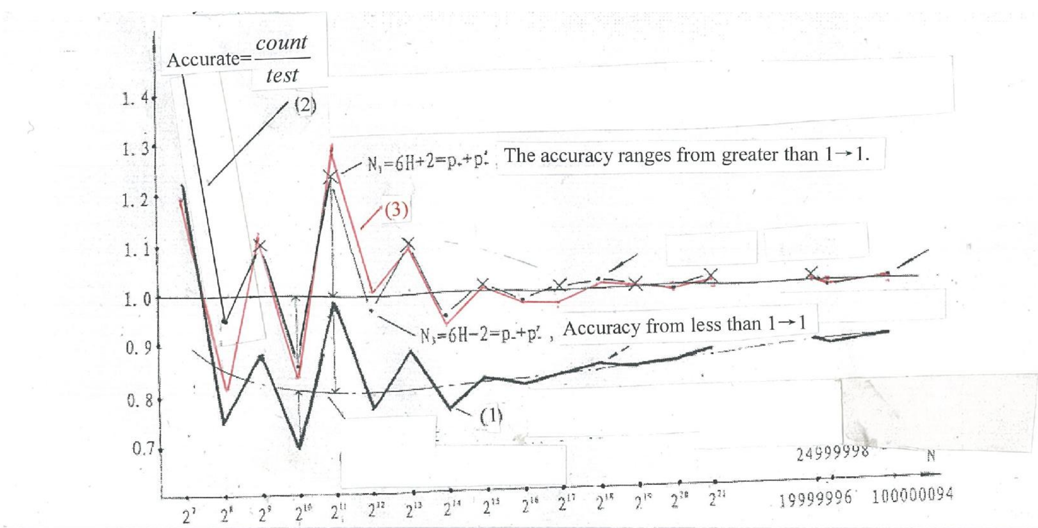

Figure 2 The accuracy of formulas (1), (2), (3).

4 Discussion.

Some of the above content hopes to help everyone understand "From the tolerance formula of even Goldbach conjecture to Hardy-Littlewood conjecture (A)".

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