The Prime Classification and Factor Structure

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Abstract. When prime numbers 2·3 compose a sieve method table with (mod6) arithmetic progressions, and rowing in 1,5 two columns number sets is a column mixed with prime numbers and composite numbers and relationships more complex; set in four columns number sets is known to be a composite number column with factor relationships. By motif number, the arrangement and classification of arithmetic, the originally ordered law, character structure, and relationship of natural number successively display. Thus,6n+1;6n-1, the two-relationship prime p and q is found between the two columns 1,5, as well as the combining form of composition numbers groups constituted of this factor structure relationship. On this basis, we also found that, instead of calculating M directly, the method of distinguishing the properties of natural number and detecting character utilizes factors, p and q, in arithmetic sequence added mode order number N to do the additive decomposition. So that we can obtain the location of Hsueh Sieve theory calculations, and simultaneously determine primes, integer factorization, and calculate composite numbers correspond, prime corresponding sum, and composite and primes correspondence and attribute structure relations. Thus, we can effectively understand (> 6) the structure character and essence of the corresponding relations, which is that even number is the sum of two odd prime numbers – the Goldbach conjecture objective law.

Introduction

From the study of natural numbers and simple calculations, human beings gradually developed into modern mathematics. In the field of number theory, primality test, integer factorization and factor distribution are all acknowledged problems in mathematics. According to the literature\[1\]-\[6\], domestic and foreign experts have already been researched and discovered many of the above problems, but they cannot completely solve these problems yet. The main reason is that they always take the problem itself as the direction of research and detection, but do not make in-depth thinking and summary with the approach to the appearance of this issue and the formation of its essence. In the face of the problem of the distribution of prime numbers and the unsolved status of the Goldbach conjecture, it is only a matter of stepping out of the problem itself and thinking deeply about the reasons why these problems cannot be solved. This article categorizes natural numbers by (mod 6) methods and studied the regularities and properties of prime numbers, composite numbers, combination forms and distributions of factor structures, expression forms of modulus numbers, properties of the number of columns (number of columns), numbers of primes and composite numbers existing in natural sequences. They are related not only to the nature of the modulus region, but also to the nature of the ordinal number, the nature of the disparity, the law of inter-count (verbs, the same below), the law of positional change, and so on. The basic theories of Xue's sieve, which have been constructed through exhaustive studies of the additive sieve table, can be used to sieve prime, factorization and reveal the structure of factors. The method of this article involves many basic rules and properties of natural number such as counting.

It will become a mathematical model of a variety of multi-dimensional representations of a very strict distribution and a new basic mathematical system. In the future, it will become an important innovative method and tool in the study of properties and laws of natural numbers, application research of computer science, application research of cryptography and DNA genetic sequencing \[7\].
Arrangement of Natural Numbers

Basic Knowledge and Symbolic Terms

Sieve table: The sieve table is a two-dimensional table with 6 columns and \( n \) rows \( (n \geq 0) \). The positive integer \( M \) is written in order from the 0th row, where 1 to 6 are marking numbers.

- **M**: Represent integers, count unit and count values in the sieve table.
- **\( L^5 \)**: Indicates the number of columns, which means the number of columns in the integer \( M \).

**Where** \( L^1 \) and \( L^5 \) are the prime columns.

**N**: Represent the ordinal number (that is, the number of rows). Which means counting range, count values of \( M \) and the rows in the sieve table for the result of the operations. When \( n \) is used, it is called the encoding number. When \( \bar{n} \) is used, it is called the original coding number.

Addition Factor Method and Concise Table Method

1. **Mark in \( L^1 \) Table Factoring Method**

   Let’s assume that \( P_1 < P_2 < \cdots < P_{k-1} \) is an arithmetic sequence. All integers in \( L^1 \) are used as counting factors one by one and denoted by \( p_i \). When \( N_1 = 1, P_1 = \alpha = 7 \) (Counting factors are denoted by \( \alpha \)). Synchronous ordinal is denoted by \( N_i, i = 1, 2, \cdots, k \). \( N_1 + P_1 = 1 + 7 = 8 \).

   First, we mark a counting factor \( P_1 \) next to the integer \( M \) in row \( N_0 \) and column \( L^1 \). At the same time, write another \( P_1 \) next to the first \( P_1 \) and rewrite it as \( P^2 \). The second factor is an ordered factor, denoted by \( \alpha_m \). Next, \( N_9 + P_1 = 8 + 7 = N_{15} \), we mark a factor \( P_1 \) next to the integer \( M \) in the row \( N_{15} \) and column \( L^1 \). According to the same way, we mark \( P_1 \) next to the integers in column \( L^1 \) and rows \( N_{22}, N_{29}, \cdots \), respectively. Now we marked up all composite numbers containing factor \( P_1 \) in column \( L^1 \). In the same way, we add each \( p_i(i = 1, 2, \cdots, k) \) and \( N_i(i = 1, 2, \cdots, k) \) until the end of sequence in column \( L^1 \). In the end, we have factorized some integers in \( L^1 \) into factors in the form of \( \alpha \cdot \alpha_m \). At the end of the first round of marking factors, some remaining integers are composite. Now we need a second round of marking process.

   This time, we use integers in column \( L^5 \) as counting factors and denoted by \( q_i \) (we use \( \varepsilon \) represent counting factors in \( L^5 \)). Because of the interrelationship between these two columns, we can use integers in column \( L^5 \) to mark integers in column \( L^1 \). This time we use the counterclockwise counting method and mark \( q_0 \) next to the integer \( M \) in the column \( L^1 \) and row \( N_4 \). At the same time, write another \( q_0 \) next to the first \( q_0 \) and rewrite it as \( q^2 \). The second factor is an ordered factor, denoted by \( \varepsilon_m \). Afterwards, adding in order, all integers containing factor \( q_0 \) in \( L^1 \) are marked. In the same way, we use every \( q_i(i = 1, 2, \cdots, k) \) as a counting factor to mark composite numbers in column \( L^1 \). All these composite numbers are factorized into a product of two factors with \( \varepsilon \cdot \varepsilon_m \) form. All the composite numbers in \( L^1 \) have been factorized. We rewrite all single factors that cannot form a factor group as \( p_i^2 \) or \( q_j^2 \). All unmarked integers in \( L^1 \) are prime numbers of the form \( 6n + 1 \).

2. **Marking Factors in \( L^5 \) Columns**

   Let’s assume that \( q_1 < q_2 < \cdots < q_{k-1} \) is an arithmetic sequence. All integers (whether or not primes) in \( L^5 \) are used as counting factors one by one and denoted by \( q_1 \). When \( q_0 = \varepsilon = 5 \), we count factor \( q_0 \) down to the row \( N_5 \). And then we mark a counting factor \( q_0 \) next to the integer \( M \) in the row \( N_5 \) and column \( L^5 \) (counting factors are denoted by \( \varepsilon \)). Next, \( N_5 + q_0 = 5 + 5 = 10 \). Now we marked up all composite numbers containing factor \( q_0 \) in column \( L^5 \). When the first round of marking process ends, all marked factors are single instead of forming factor groups. Now we use integers in the column \( L^1 \) to mark integers in the column \( L^5 \) as the same way above.
| Integer form | $6n+1$ | $6n+2$ | $6n+3$ | $6n+4$ | $6n-1$ | $6n$ |
|--------------|------|------|------|------|------|------|
| Factor symbol | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ | $\epsilon$ | $\zeta$ |
| Factor group | $\alpha \cdot \alpha \cdot \epsilon \cdot \epsilon \cdot \epsilon_m$ | $2 \alpha 2 \delta 4 \epsilon$ | $3 \alpha \gamma 3 \gamma 3 \epsilon$ | $4 \alpha 2 \beta 2 \epsilon$ | $\epsilon \cdot \alpha \cdot \alpha \cdot \epsilon \cdot \epsilon \cdot \epsilon_m$ | $6 \alpha 6 \delta 6 \gamma 6 \delta 6 \epsilon 6 \zeta$ |
| $M \in \mathbb{E}^3$ | $1 (p_i)$ | $2$ | $3$ | $4$ | $5 (q_j)$ | $8$ |
| $N_i$ | 1 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 2 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 3 | 19 | 20 | 21 | 22 | 23 | 24 |
| | 4 | 25 | $5 \cdot 5$ | 26 | 27 | 28 | 29 | 30 |
| | 5 | 31 | 32 | 33 | 34 | 35 | 5 | 36 |
| | 6 | 37 | 38 | 39 | 40 | 41 | 42 | 43 |
| | 7 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
| | 8 | 49 | $7 \cdot 7$ | 50 | 51 | 52 | 53 | 54 |
| | 9 | 55 | $5 \cdot 11$ | 56 | 57 | 58 | 59 | 60 |
| | 10 | 61 | 62 | 63 | 64 | 65 | $5 \cdot 13$ | 66 |
| | 11 | 67 | 68 | 69 | 70 | 71 | 72 | 73 |
| | 12 | 73 | 74 | 75 | 76 | 77 | $11 \cdot 7$ | 78 |
| | 13 | 79 | 80 | 81 | 82 | 83 | 84 | 85 |
| | 14 | 85 | $5 \cdot 17$ | 86 | 87 | 88 | 89 | 90 |
| | 15 | 91 | $7 \cdot 13$ | 92 | 93 | 94 | 95 | $5 \cdot 19$ | 96 |
| | 16 | 97 | 98 | 99 | 100 | 101 | 102 | 103 |
| | 17 | 103 | 104 | 105 | 106 | 107 | 108 | 109 |
| | 18 | 109 | 110 | 111 | 112 | 113 | 114 | 115 |
| | 19 | 115 | $5 \cdot 23$ | 116 | 117 | 118 | 119 | $17 \cdot 7$ | 120 |
| | 20 | 121 | $11 \cdot 11$ | 122 | 123 | 124 | 125 | $5 \cdot 25$ | 126 |
| | 21 | 127 | 128 | 129 | 130 | 131 | 132 | 133 |
| | 22 | 133 | $7 \cdot 19$ | 134 | 135 | 136 | 137 | 138 |
| | 23 | 139 | 140 | 141 | 142 | 143 | $11 \cdot 13$ | 144 |
| | 24 | 145 | $5 \cdot 29$ | 146 | 147 | 148 | 149 | 150 |
| | 25 | 151 | 152 | 153 | 154 | 155 | $5 \cdot 31$ | 156 |
| | 26 | 157 | 158 | 159 | 160 | 161 | $23 \cdot 7$ | 162 |
| | 27 | 163 | 164 | 165 | 166 | 167 | 168 | 169 |
| | 28 | 169 | $13 \cdot 13$ | 170 | 171 | 172 | 173 | 174 |
| | 29 | 175 | $7 \cdot 25$ | 176 | 177 | 178 | 179 | 180 |
| | 30 | 181 | 182 | 183 | 184 | 185 | $5 \cdot 37$ | 186 |
| | 31 | 187 | $11 \cdot 17$ | 188 | 189 | 190 | 191 | 192 |
| | 32 | 193 | 194 | 195 | 196 | 197 | 198 | 199 |
rounds of marking process for /g6−3−

pass the count factor as performed using integers in two columns as the facts ors, the composite numbers in the two columns prime numbers, which has been verified [6]. When the two rounds of the marking process are factorized into we denote the count factor as /g6−3− analogy, make all factor groups represented as /g6−3−

Factorial derivation in equation is a combination of type factors. One can be drawn as 6n+1 and the other can be written as 6n−1. The multiplicative structure is established.

Among the sieve table, 2 and 3 are prime numbers and the attributes of Table 1 are 6n+1 and 6n−1. The multiplicative structure is thereby showing that the relationship between the sieve table attribute and the classification structure.

There will also be duplicate marks.

3. Factor Structure in L^1

The factor combination in column L^1 are two homogeneous factors. When we denote the count factor as 6n + 1, the ordered factor is further denoted as 6n + 1.(α ∙ α_m). On the contrary, when we denote the count factor as 6n − 1, the order factor is further denoted as 6n − 1.(ε ∙ ε_m). So the Factorial derivation in L^1 are as follows

(α ∙ α_m) = (6n_1 + 1)(6n_2 + 1) = 6(6n_1n_2 + n_1 + n_2) + 1
(ε ∙ ε_m) = (6n_1 − 1)(6n_2 − 1) = 6(6n_1n_2 − n_1 − n_2) + 1

The above factor structure summation calculation formula is synchronized with the sieve table, thereby showing that the relationship between the sieve table attributes and the classification structure is established.

4. Factor Structure Relationship in L^5

The composite number in the L^5 column can be expressed as a multiplication of two distinct type factors. One can be drawn as 6n+1 and the other can be written as 6n−1. The multiplicative equation is a combination of ε ∙ α_m represent two heterogeneous factors. On the contrary, when we pass the count factor as 6n + 1 then the order factor will be 6n − 1. The Factorial derivation in L^5 are as follows:

(ε ∙ α_m) = (6n_1 − 1)(6n_2 + 1) = 6(6n_1n_2 + n_1−n_2) − 1
(α ∙ ε_m) = (6n_1 + 1)(6n_2 − 1) = 6(6n_1n_2 − n_1 + n_2) − 1

The above factor structure summation calculation formula is synchronized with the sieve table. Thereby showing that the relationship between the sieve table attributes and the classification structure.

Overview of Sieving Table Properties

Among the sieve table, 2 and 3 are prime numbers and the attributes of Table 1 are 6n + 2; 6n + 3; 6n + 4; and the integer M in 6n is an arithmetic sequence with Composite numbers instead of prime numbers, which has been verified [6]. When the two rounds of the marking process are performed using integers in two columns as the factors, the composite numbers in the two columns are factorized into L^1: α ∙ α_m ε ∙ ε_m and L^5: ε ∙ α_m α ∙ ε_m.

L^1: α(ε ∙ ε_m); ε(α ∙ ε_m); α(α ∙ α_m) ε(ε ∙ α_m); (α ∙ α)(ε ∙ ε);⋯
L^5: ε(α ∙ α_m); α(ε ∙ α_m); α(α ∙ ε_m) α(α ∙ ε_m); (ε ∙ ε)(α ∙ α);⋯

The process of marking factors is to be able to convert the integers M in L^1 and L^5 columns into p_i and q_j and to associate with the ordinal N_t, and then to mark factors in order. In addition

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 33 | 199 | 200 | 201 | 202 | 203 |
| 34 | 205 | 541 | 206 | 207 | 208 |
| 35 | 211 | 212 | 213 | 214 | 215 |
| ... | ... | ... | ... | ... | ... |
| 1665 | 9991 | 97103 | 9992 | 9993 | 9994 |
| 1666 | 9997 | 13769 | 9998 | 9999 | 10000 |
| ... | ... | ... | ... | ... | ... |
to the inter-count relationship of two columns, it also includes the count, count order and other properties.

Remaining unfactorized integers in two columns $L^1$, $L^5$ are infinitely many primes. Prime numbers in the two columns are $L^1$: $6n + 1$ and $L^5$: $6n - 1$ types, respectively. The factor group in the column $L^1$ can be expressed as $\alpha \cdot \alpha_m \cdot \varepsilon \cdot \varepsilon_m$. The factor group in the column $L^5$ can be expressed as $\varepsilon \cdot \alpha_m \cdot \alpha \cdot \varepsilon_m$. There is no factor of form $q^2$ in the column $L^5$. As to the resolution of the composite number, we should follow, (mod 6), the arrangement classification property $6n + 1$; $6n - 1$ and dominance low property. But, after resolve the composite number $M$ in the process of marking factor $\alpha$ and $\varepsilon$, the latent law of prime number appears, namely subtracting composite number is prime number. The properties of them are same. Furthermore, methods are obvious in marking digital factor. But, there exits one latent law property in marking digital factor which is the ‘frequency' in ordered factor, such as $M = 25$ in $L^1$ of $N_4$, its factor structure is $5 \times 5$. The later factor (ordered factor) represent that, according its cumulative relationship (bias), the former factor 5 calculate down5 times from his basic location to 25 locations of factor groups, as well as representing that the homologous factor which is supplementary filled in become $p^2$; such as $M = 55$ in $L^1$ of $N_9$, its factor structure is $5 \times 11$. The ordered factor representing 5 calculates 11 times, in return 11 is calculated 5 times to attain the factor group location 55. Other ordered factor latent law is similar. The calculation law and the filling in method in the sieve method table can refer to lecture $[8][9]$.

The arrangement of the natural number set (mod 6) can be infinity. But, the sieve method table can not be infinity. The following utilizes science calculation method to certify again.

**Various Rules, Relationships, Properties, Structures of the Sieve Table**

**Relationship in the Sieve Table**

When the integer $n$ modulo 6, there are only 5 results $0,1,2,3,4,5$.

$$M = 6N_i + L^5$$  \hspace{1cm} (1)

If $M \equiv 5(\text{mod } 6)$, we write $L^5_{N_i} = M = 6n + 5$. The integer in column $L^5$ is usually expressed as $L^5_{N_i} = M = 6n - 1$. When an integer in column $L^5$ is denoted by $6n - 1$, the calculation result is different from the ordinal number, and an ordinal difference will occur. The integer of row $N_9$ and column $L^5$ is 23 and can be expressed as form $6n - 1$. But $6 \times 3 - 1 = 17 \neq 23$. This difference “1” is called “ordinal difference”. To solve this problem, we use $n + 1$ instead of $n$. When we use $W_M$ to represent the position of an integer in the sieve table, we can derive the following formula.

$$W_M = L^5_{N_i} \iff L^5_{N_i} = W_M$$  \hspace{1cm} (2)

$$W_M = \frac{M}{6} = N_i + L^0, W_M = L^6_{N_i} = L^0_{N_i}$$

When $L = 0$, the real column is $N - 1$. And we use $M = 6(N + 1)$ to calculate $M$.

**Laws of Sieve Table and Verification**

1. **Relationships of Sieve Table**

According to the relationship between integers and rows and columns in the sieve table. We have

$$M = 6N_i + L^5 = R^L_{N_i} \iff M = R^L_{N_i} = R^L_{N_i} = L^5_{N_i}$$  \hspace{1cm} (3)

Not only can we find any integer value, if $M = R$, but we can also find the position of any value unit. If we want to find the number of row $N_{27}$ and column $L^1$, then we use formula.

$$R^1_{23} = M = 6 \times 23 + 1 = 139$$

$$R^5_{27} = M = 6 \times 27 + 5 = 167$$
2. Counting Value Formula

According to the constant difference relationship between count values of the sieve table, when we use ‘c’ to represent the counting time can we find any position of a count unit. We use K to represent a composite.

\[ L^3R_k = M \] \hspace{1cm} (4)

Suppose that there is an integer 37. When we count it down 3 times, we can calculate its position as showed below.

\[ L^3R_k = L^337K = 6 \times 37 \times 3 + 37 = 703 \]

\[ W_{703} = L^1_{117}, \quad 703 = 37 \times 19 \]

3. Ordinal Number Formula

We can calculate the ordinal number of every count process based on the sieve table. If \( R_{n_i} \) is an ordinal number, then

\[ L^3R_{n_i} = R \cdot C + n (i = 1, 2, 3, \cdots , k) \] \hspace{1cm} (5)

If we want to find the position of the 12th count value with the same factor R when \( n_i = 2, R = 13 \). Based on formula 5 then we have

\[ L^1_{12}N_i = 13 \times 12 + 2 = 158, \]

\[ L^1_{150} = 949 = 13 \times 73 \]

4. Original Code Number and Ordinal

When marking integers with factor units \( \alpha \) and \( \varepsilon \), according to the original code number \( n_{\alpha} \) of the factor, the position of the \( n_{\alpha} \) ordinal below the factor unit can be found, that is,

\[ L^3_{(\alpha)}N_i = \alpha \cdot c + n_i \quad \text{or} \quad \varepsilon \cdot c + n_i \] \hspace{1cm} (6)

To find the ordinal number of the 31th count value which containing the factor 7 in the \( L^5 \) column, we can calculate as follows.

\[ L^5_{31}N_i = 7 \times 31 + 5 = 222 \]

5. Square Factor Ordinal Position Calculation and Combination

The \( p^2 \) of the factor \( \alpha \) is the product of the integer M, then find the position and combination of the factor ordinal \( N_i \) of the factor \( p \) (M and N have a synchronous relationship and n is a code number, the same below)

\[ N(L^1p_i^2) = p_i \cdot n_i + n_i (i = 1, 2, \cdots , k) \] \hspace{1cm} (7)

When \( p = 13, n = 2 \) we want to know the position of ordinal of \( p^2 \) and combined form and can be calculated as below.

\[ N(L^1p_i^2) = 13 \times 2 + 2 = 28 \]

According to position formula (2), we have \( L^1_{28} = 169 = 13 \times 13 \). So the factor combination form is \( \alpha \cdot \alpha_m \). The factor \( \varepsilon \) of \( q_j^2 \) is the product of the integer M, then the factor ordinal n position and combination form of the factor b are found:

\[ N(L^1q_j^2) = q_j \cdot (n_j + 1) - (n_j + 1) (i = 1, 2, \cdots , k) \] \hspace{1cm} (8)

Let’s suppose that in column \( L^1 \) q = 11, n = 1, we need to find the ordinal position and combination form of factors q. Then we have

\[ N(L^1q_j^2) = 11 \times (1 + 1) - (1 + 1) = 20 \]

According to position formula (2), we have \( L^1_{20} = 121 = 11 \times 11 \).

6. Ordinal Number and Position of the Same Factor Group Calculation and Combination Form

To find the ordinal number of factor group \( \alpha \cdot \alpha_m \) and its value in column \( L^1 \), Where \( n_{(\alpha)} \) is the counting factor code number and \( n_{(\alpha_m)} \) is the order factor code number.

\[ N(L^1k: \alpha \cdot \alpha_m) = \alpha_m \cdot n_{(\alpha)} + n_{(\alpha_m)} \] \hspace{1cm} (9)
If \( p = 61 \), then \( n_{(a)} = 10 \). If \( p = 97 \), then \( n_{(a_m)} = 16 \) (vice versa).

\[
\begin{align*}
N(L^1k: 61 \times 97) &= 97 \times 10 + 16 = 986 \\
N(L^1k: 97 \times 61) &= 61 \times 16 + 10 = 986
\end{align*}
\]

So \( N = 986 \) and \( L^1M = 5917 \).

To find the ordinal number of factor group \( \varepsilon \cdot \varepsilon_m \) and its value in column \( L^1 \), where \( n_{(\varepsilon)} \) is the counting factor code number and \( n_{(\varepsilon_m)} \) is the order factor code number.

\[
N(L^1k: \varepsilon \cdot \varepsilon_m) = \varepsilon_m \cdot (n_{(\varepsilon)} + 1) - (n_{(\varepsilon_m)} + 1)
\] (10)

If \( q = 47 \), then \( n_{(\varepsilon)} = 7 \). If \( q = 149 \), then \( n_{(\varepsilon_m)} = 24 \) (vice versa).

\[
\begin{align*}
N(L^1k: 47 \times 149) &= 149 \times (7 + 1) - (24 + 1) = 1167 \\
N(L^1k: 149 \times 47) &= 47 \times (24 + 1) - (7 + 1) = 1167
\end{align*}
\]

We have \( N = 1167, L^1 = 7003 \).  

7. The Position Calculation and Combination Form of Ordinal Number and Heterogeneous Factor Group

In order to find the ordinal number of factor group \( \alpha \cdot \varepsilon_m; \varepsilon \cdot \alpha_m \) and its value in column \( L^1 \), where \( n_{(\alpha)} \) is the counting factor code number and \( n_{(\varepsilon_m)} \) is the order factor code number. We have

\[
N(L^5k: \alpha \cdot \varepsilon_m) = \varepsilon_m \cdot n_{(\alpha)} + n_{(\varepsilon_m)}
\] (11)

\[
N(L^5k: \varepsilon \cdot \alpha_m) = \alpha_m \cdot (n_{(\varepsilon)} + 1) - (n_{(\varepsilon_m)} + 1)
\] (12)

If \( p = 103 \), then \( n_{(\alpha)} = 17 \). If \( q = 197 \), then \( n_{(\varepsilon_m)} = 32 \). We have

\[
N(L^5k: 103 \times 197) = 197 \times 17 + 32 = 3381
\]

If \( q = 197 \), then \( n_{(\varepsilon)} = 32 \). If \( p = 103 \), then \( n_{(\alpha_m)} = 17 \). We have

\[
N(L^5k: 197 \times 103) = 103 \times (32 + 1) - (17 + 1) = 3381
\]

We have \( N = 3381, L^5 = 20291 \).

The Distribution and Number of Combining Groups of Factor Groups in the Agreed Number Range

Calculate the Number of Groups of Factor Combination Groups within the Agreed Range in \( L^5 \)

Find out: how many factor combination groups with different types of \( \varepsilon \cdot \alpha_m; \alpha \cdot \varepsilon_m \) are in range \( M = 1000 \). It should be noted here that since the natural number 1000 is a cardinality of column 4, the calculation in \( L^5 \) should be based on the property of the ordinal difference \( N - 1 \), i.e. 166 - 1, since this cardinality is 1001 > 1000 in \( L^5 \). \( L^5M = 1001 - 6 = 995 \), 995 < 1000 is in a synchronous range. Then, the maximum integer which is not exceeding \( \sqrt{M} \) is found, the value range formula is established, and the encoding number \( n \) and the calculation number are calculated:

\[
n(s) = \left[ \frac{\sqrt{M}}{6} \right]
\] (13)

According to equation (13), the value range of numerical units and calculation times (taking integer)

\[
n(s) = \left[ \frac{\sqrt{M}}{6} \right] = \left[ \frac{31}{6} \right] = 5 \quad \text{are:}
\]

\[
L^1a_i = n_i = 1,2,3,4,5; \\
R = 7,13,19,25,31; \\
L^5e_j = n_j = 0,1,2,3,4,5;
\]

\[
R = 5,11,17,23,29,31;(35>R \text{ is not taken})
\]

According to equation (13), the range of values is given:(taking the aliquot parts)

If \( N(L^5k: R \cdot R_m) \) represents the mixed factor group, \( C \) represents the number of factor groups: then
\[
N(L^5)R \cdot R_m c = \sum_{\varepsilon_j=0}^{n} \left[ \frac{N-n_i}{\varepsilon_j} - n_i + \sum_{a_j=1}^{n+i} \left[ \frac{N+(n_i+1)}{a_i} \right] - n_i \right]; (i \text{ and } j \text{ of } a_i; \varepsilon_j \text{ correspond to the code numbers } i = 1, 2, \cdots, k; j = 0, 1, 2, \cdots, k)
\]

Figure out: how many factor combination groups with different types of \(\varepsilon \cdot \alpha_m; \alpha \cdot \varepsilon_m\) are in range \(M = 1000\), and the value range is given according to equations (13) and (14).

Solution: (taking the aliquot parts)

\[
165(L^5)R \cdot R_m c = \sum_{\varepsilon_j=0}^{5} \left[ \frac{165 - 0}{5} - 0 + \frac{165 - 1}{11} - 1 + \frac{165 - 2}{17} - 2 + \frac{165 - 3}{23} - 3 + \frac{165 - 4}{29} - 4 \\
+ \frac{165 + 1 + 1}{7} - 1 + \frac{165 + 2 + 1}{13} - 2 + \frac{165 + 3 + 1}{19} - 3 + \frac{165 + 4 + 1}{25} - 4 \\
+ \frac{165 + 5 + 1}{31} - 5 \right] = 33 + 13 + 7 + 4 + 1 + 22 + 10 + 5 + 2 + 0 = 97
\]

From the above calculation results, it can be seen that: calculating in the range of 1000 in \(L^5\), there are 97 groups of different types of factor combination groups of \(\varepsilon \cdot \alpha_m; \alpha \cdot \varepsilon_m\), among which \(\varepsilon \cdot \alpha_m\) are 58 groups. \(\alpha \cdot \varepsilon_m\) are 39 groups and the process of repeated number of and compound factors. \(N(L^1)^R \cdot R_m \) refer to the literature [8]

### Separation of the Repetition Factor Binding Group within the Agreed Scope \(L^5\)

According to the number law and the arrangement method of the sieve table, the repeated factor groups inevitably appear in the repeated number process of the output value. The following method is used to separate the repeated factor group.

#### 1. When a Factor in \(L^5\) Factor Group Is Combined in the Form of \(\varepsilon \cdot \varepsilon_m\)

If the decomposition factor in \(L^5\) use the homogenous \(\varepsilon \cdot \varepsilon_m\) repetition factor group combination law or if the distribution position is in the form of \(\varepsilon \cdot \varepsilon_m\), the following equation is utilized to calculate:

\[
L_N(\varepsilon \cdot \varepsilon_m)C \left[ \frac{(N+1)+[\varepsilon(n+1)-(n+1)]}{\varepsilon \cdot \varepsilon_m} \right]
\]

Let \(M = 1000\), and when \(N_i = 165\), the repeat factor groups of 5,11,17 are respectively calculated. According to the encoding formula of factor (13), \(n = 0:5\); \(N = 1:11\); \(n = 2 = 17\), the number of binding groups of class \(\varepsilon \cdot \varepsilon_m\) within the agreed distribution range of repetition factor groups is calculated within \(L^5\).

\[
L^5_{165}(5 \cdot 5)C = \left[ \frac{(165 + 1) + [5 \times (0 + 1) - (0 + 1)]}{5 \times 5} \right] = \left[ \frac{166 + 4}{25} \right] = 6
\]

\[
L^5_{165}(5 \cdot 11)C = \left[ \frac{(165 + 1) + [5 \times (1 + 1) - (0 + 1)]}{5 \times 11} \right] = \left[ \frac{166 + 9}{55} \right] = 3
\]

\[
L^5_{165}(5 \cdot 17)C = \left[ \frac{(165 + 1) + [5 \times (2 + 1) - (0 + 1)]}{5 \times 17} \right] = \left[ \frac{166 + 14}{85} \right] = 2
\]

From the above calculation results, it can be seen that the total distribution of the repetition factor groups of these three factors in \(L^5\) is as follows:

25: \(25 \times 5\); 25\( \times 11\); 25\( \times 17\); 25\( \times 23\); 25\( \times 29\); 25\( \times 35\); (Leave the parentheses as the base factor group)

55: \(55 \times 5\); 55\( \times 11\); 55\( \times 17\); 85: \(85 \times 5\); 85\( \times 11\); So: The repeat factor groups are 8 groups

#### 2. When the Factors in \(L^5\) Combine in the Form of \(\alpha \cdot \alpha_m\)

If the decomposition factor in \(L^5\) is in the form of homogeneous \(\alpha \cdot \alpha_m\) repetition factor combination rule or representation of distribution location, the following formula is used to calculate:

\[
L_N(\alpha \cdot \alpha_m)C = \left[ \frac{(N+1)+[\alpha \cdot \alpha_m]}{\alpha \cdot \alpha_m} \right]
\]

Let’s say \(M = 1000\), and when \(N_i = 165\), we calculate factor 7. According to the encoding formula of factor (13), \(n=1:7\), the number of combination groups of \(\alpha \cdot \alpha_m\) type repetition factor groups within the agreed distribution range of repetitive factor groups in \(L^5\) is calculated.
\[ L_{165}^5(7 \cdot 7)C = \left[ \frac{(165 + 1) + (7 \times 1 + 1)}{7 \times 7} \right] = \left[ \frac{166 + 8}{49} \right] = 3 \]

From the above calculation results, it can be seen that the full range distribution of \(7^2\) repetition factor groups in \(L^5\) is as follows:

49: \((49 \times 5); 49 \times 11; 49 \times 17\)

Get: the repeat factor group is 2 groups, (the basic factor group is retained in parentheses)

3. When the Factors in \(L^5\) Combine in the Form of \(\varepsilon \cdot \alpha_m\)

If the decomposition factor in \(L^5\) use the form of the combination law of heterogeneous \(\varepsilon \cdot \alpha_m\) repeat factor group or the distribution position is \(\varepsilon \cdot \alpha_m\):

\[ L_N^5(\varepsilon \cdot \alpha_m)C = \left[ \frac{(N-(\varepsilon \cdot n+\varepsilon \cdot m))}{\varepsilon \cdot \alpha_m} \right] \]

Let's say \(M = 1000\), and when \(N_i = 165\), we calculate factor 7,13,19. According to the encoding formula of factor (13), \(n = 1: 7., n = 2: 13; n = 3: 19\), the number of combination groups of \(\varepsilon \cdot \alpha_m\) type repetition factor groups within the agreed distribution range of repetitive factor groups in \(L^5\) is calculated.

\[ L_{165}^5(5 \cdot 7)C = \left[ \frac{165 - [5 \times 1 + 0]}{5 \times 7} \right] = \left[ \frac{165 - 5}{35} \right] = 4 \]

\[ L_{165}^5(5 \cdot 13)C = \left[ \frac{165 - [5 \times 2 + 0]}{5 \times 13} \right] = \left[ \frac{165 - 10}{35} \right] = 2 \]

\[ L_{165}^5(5 \cdot 19)C = \left[ \frac{165 - [5 \times 3 + 0]}{5 \times 19} \right] = \left[ \frac{165 - 5}{95} \right] = 1 \]

From the above calculation results, the full range distribution of the repetition factor groups of these three factor units in \(L^5\) is as follows:

35: 35 \times 7; 35 \times 13; 35 \times 19; 35 \times 25;

65: 65 \times 7; 65 \times 13; 95: 95 \times 7;

Get: the repeat factor group is 7 groups. Within them, 35 \times 25 overlaps with the previous 25 \times 35, but there is also a set of repeated factor groups including factor 7 \((7 \times 125)\) that need to be separated. (see table 4)

According to the calculation results \((8 + 2 + 7 = 17\) groups\) in 3.2.1; 3.2.2. 3.2.3 segment. Therefore, the number of groups that need to separate the repeated factor binding groups within the agreed range of \(N_i = 165\) is 17 groups. According to equation (13), the total factor groups within the scope of \(N_i = 165\) is 97 groups.

\[ L_{165}^5(R \cdot R_m)C = 97 - 17 = 80 \]

After subtracting 17 repeat factor groups, the base factor groups are 80 in the range \(N_i = 165\)

\[ L_{165}^5 \pi(x) = 165 - 80 = 85 \]

Therefore, when \(N_i = 165\), the rest is 85 morphemes of \((6n - 1)\) class as a result of subtracting 80 basic factor groups. Above calculation about factor group within the prescribed scope prove that within a certain range the combination group numbers of factor group can separate repeated factor group to calculate the number of basic factor groups and the numbers of prime latent with regularity, and classification.

In a repeated output value, except for a set of basic factors combined group, each compound factor represents the form of one or multiple repeated Numbers. In particular, when the compound factor unit is the square number of prime Numbers and the sequence factor is also the prime number, there is only one compound factor group except the basic factor combination group in this number. If it is a compound factor unit that combines two prime Numbers, and the sequence factor is also a prime number, the compound factor groups of the number are two groups. If it is a compound factor unit that is combined by three prime factors, or if the sequence factor is also a compound factor unit, the number of compound factor groups is more than three groups. And in each of its combinations, one of the counting number or counting sequence factors is always a
composite number. Therefore, this composite number becomes the representative number of compound factors.

**The Relationship between Prime Numbers and Even Numbers**

It can be inferred from the above, the distribution of the composite number M is regular. Their distribution is directly related to the factors p and q. The relevant calculation method for p, q can be used to explore the correlation law of the composite number M.

**Correspondence between Ordinal and Cardinality and Even Number**

It is known that cardinalities of each column in the sieve table is a sequence with common difference of mod 6. Then the three cardinalities of the even columns are:

\[ a: L^{30}_{30} = 182, \quad b: L^{26}_{26} = 172, \quad c: L^{6}_{6} = 162 \]

When these three integers are respectively represented by the sum of the two numbers in the columns \( L^1 \) and \( L^5 \), then it will become the following three relationships shown by a, b, c. If we use the synchronous relationship between N and M one by one and expressed the corresponding sums of the ordinal \( N_i \) and the cardinalities M respectively by formulas, there are the following corresponding forms.

\[ a: L^{30}_{30} = L^{1}_{N_1} + L^{1}_{N_2} \ldots = L^{1}_{1} M_7 + L^{1}_{5} M_{17} \ldots \]
\[ L^{2}_{N}: 30 = L^{1}_{1} 1 \leftrightarrow 29; 2 \leftrightarrow 28; 3 \leftrightarrow 27; 4 \leftrightarrow 26; \ldots; 15 \leftrightarrow 15. \]
\[ L^{2}_{M}: 182 = L^{1}_{7} \leftrightarrow 175; 13 \leftrightarrow 169; 19 \leftrightarrow 163; 25 \leftrightarrow 157; \ldots; 91 \leftrightarrow 91. \]

We know that the cardinality M of \( L^5 \) has the property of the difference of ordinal numbers, the corresponding sums of 172 in \( L^4 \) are expressed as follows:

\[ b: L^{26}_{26} = L^{5}_{N_1} + L^{5}_{N_2} \ldots = L^{5}_{5} M_7 + L^{5}_{5} M_{17} \ldots \]
\[ L^{4}_{N}: 28 = L^{5}_{0} (0 + 1) \leftrightarrow 27; (1 + 1) \leftrightarrow 26; (2 + 1) \leftrightarrow 25; \ldots; (13 + 1) \leftrightarrow 14. \]
\[ L^{4}_{M}: 172 = L^{5}_{5} 5 \leftrightarrow 167; 11 \leftrightarrow 161; 17 \leftrightarrow 155; 23 \leftrightarrow 149; \ldots; 83 \leftrightarrow 89. \]

It is known from the nature of the modulus. The even numbers in column \( L^1 \) the sum of the cardinality of the \( L^1 \) column and the cardinality of the \( L^5 \) column. When the corresponding sum of the even number 162 in \( L^6 \) is also represented in a one-to-one correspondence, it is

\[ c: L^{162}_{6} = L^{1}_{N_1} M_7 + L^{5}_{N_3} M_{155} \]
\[ L^{5}_{N}: 26 = L^{1}_{1} \leftrightarrow L^{5}_{25}; L^{5}_{2} \leftrightarrow L^{5}_{24}; L^{5}_{3} \leftrightarrow L^{5}_{23}; L^{5}_{4} \leftrightarrow L^{5}_{22}; \ldots; L^{5}_{13} \leftrightarrow L^{5}_{13}. \]
\[ L^{4}_{M}: 162 = L^{5}_{17} \leftrightarrow L^{5}_{155}; L^{5}_{13} \leftrightarrow L^{5}_{149}; L^{5}_{19} \leftrightarrow L^{5}_{143}; \ldots; L^{5}_{79} \leftrightarrow L^{5}_{83}. \]
\[ L^{4}_{5} 5 \leftrightarrow L^{5}_{157}; L^{5}_{11} \leftrightarrow L^{1}_{151}; L^{5}_{17} \leftrightarrow L^{1}_{145}; \ldots; L^{5}_{83} \leftrightarrow L^{1}_{79}. \]

**Correspondences and Relationships in Prime Columns**

1. **The Relationship between the Cardinality M in the Composite Column and the Prime Column**

   According to the nature of the modulus, this problem is also discussed in the corresponding form of the upper and lower terms in prime sequences. Then, any even number can be split into the sum of two prime numbers with different forms. They are respectively expressed as the following correspondence.

   \[ (\Lambda V \text{ represent the upper and lower terms}) \]
   \[ L^{2}_{M} = L^{1}_{p(\Lambda)} + L^{1}_{p(V)} = L^{3}_{3} + L^{5}_{5} q \]
   \[ L^{4}_{M} = L^{5}_{5} q(\Lambda) + L^{5}_{5} q(V) = L^{3}_{3} + L^{3}_{1} p \]
   \[ L^{6}_{M} = L^{1}_{p(\Lambda)} + L^{5}_{5} q(V) = L^{5}_{5} q(\Lambda) + L^{1}_{p(V)} \]

   It can be inferred from the above three conditions that when an even number belongs to the column \( L^{2}_{2} \) or the column \( L^{4}_{4} \). It can be split into the sum of two prime numbers, and one of the prime numbers is 3, e.g.

   \[ L^{2}_{2} 8 = 5 + 3; L^{2}_{2} 14 = 11 + 3; L^{2}_{2} 20 = 17 + 3; L^{4}_{4} 26 = 23 + 3; L^{2}_{5} 32 = 29 + 3; \ldots \]
\[ L_1^4 \cdot 10 = 7 + 3; L_2^4 \cdot 16 = 13 + 3; L_3^4 \cdot 22 = 19 + 3; L_4^4 \cdot 34 = 31 + 3; L_5^4 \cdot 40 = 37 + 3; \ldots \]

If we look the following even numbers, however, they cannot represent as a sum of two prime numbers which one of them is 3.

\[ L_6^4 \cdot 38 = 35 + 3; L_{11}^4 \cdot 68 = 65 + 3; L_{13}^4 \cdot 80 = 77 + 3; L_{20}^4 \cdot 122 = 119 + 3; L_{21}^4 \cdot 128 = 125 + 3; \ldots \]

\[ L_4^4 \cdot 28 = 25 + 3; L_9^4 \cdot 52 = 49 + 3; L_9^4 \cdot 58 = 55 + 3; L_{13}^4 \cdot 94 = 91 + 3; L_{20}^4 \cdot 124 = 121 + 3; \ldots \]

Those numbers with dot are not prime numbers, so these splits are not the sum of prime numbers but the sum of a composite number and a prime number.

By the above properties, based on the nature of modulus or the nature of ordinal \( N_i \), after checking Table 1, it will be found that when the ordinal number of \( N_i \cdot i - 1 \) in \( L^2 \) is \( N_i \) as one of \( L^5 \), if this \( N_i \) is the position of a prime number in column \( L^5 \), then the sum of the primes in \( L^5 \) and 3 is the M in \( L^2 \).

\[ L_{N_i-1}^2 \cdot M = L^5 \cdot M + 3 \]

When \( M \) in \( L^4 \) and a prime p in \( L^1 \) are all in the \( N_i \) line, then the sum of the prime number p in \( L^1 \) and the prime number 3 is M in \( L^4 \).

\[ L^4 \cdot M = L^1 \cdot M + 3 \]

Due to the modulus property, any even number M of \( L^6 \) cannot be represented by the sum of 3 and another prime number p.

2. Correspondence between Even Columns and Prime Columns

Let three even numbers in the same row be \( L_{10}^2 \cdot 62; L_{10}^4 \cdot 64; L_{10}^6 \cdot 66 \).

When we split each even number into the sum of prime numbers with different forms, we found some correspondence as showed below.

\[
\begin{align*}
L_{10}^2 \cdot 62 &: \begin{cases}
L^1 \leftrightarrow L^1: \\
7 \leftrightarrow 55 \\
13 \leftrightarrow 49 \\
19 \leftrightarrow 43 \\
25 \leftrightarrow 37 \\
31 \leftrightarrow 31
\end{cases} &
L_{10}^4 \cdot 64 &: \begin{cases}
L^5 \leftrightarrow L^5: \\
5 \leftrightarrow 59 \\
11 \leftrightarrow 53 \\
17 \leftrightarrow 47 \\
23 \leftrightarrow 41 \\
29 \leftrightarrow 35
\end{cases}
\end{align*}
\]

\[
\begin{align*}
L_{10}^6 \cdot 66 &: \begin{cases}
L^1 \leftrightarrow L^5: \\
7 \leftrightarrow 59 \\
13 \leftrightarrow 53 \\
19 \leftrightarrow 47 \\
25 \leftrightarrow 41 \\
31 \leftrightarrow 35
\end{cases} &
L_{10}^6 \cdot 66 &: \begin{cases}
L^5 \leftrightarrow L^5: \\
37 \leftrightarrow 29 \\
43 \leftrightarrow 23 \\
49 \leftrightarrow 17 \\
55 \leftrightarrow 11 \\
61 \leftrightarrow 5
\end{cases}
\end{align*}
\]

It can be seen from the corresponding forms above, when an even number M belongs to the column \( L^2 \) it can only be expressed as the sum of two primes with \( 6n + 1 \) form. When an even number M belongs to the column \( L^6 \), it can only be expressed as the sum of a prime of type \( 6n + 1 \) and a prime of type \( 6n - 1 \). For even numbers in column \( L^6 \), there are more ways to represent the sum of two primes compared to columns \( L^2 \) and \( L^4 \). Therefore, according to the relationship between the number of properties of the even number M and the prime number p and the corresponding relationship in the prime number column, we can know from the law of the sum of the prime numbers p of the two even-numbered columns \( L^2 \) or \( L^4 \), and then calculate from the literature [8] and above. The law shows that it can be inferred that the corresponding and regular of the prime numbers p in the even number M of \( L^4 \) also holds.

Conclusion

This paper discusses the sieve table composed of the minimum prime number 2×3, utilizing the simplest additive sieve theory to show various laws and factor structures of natural Numbers in a direct way. This paper discusses the natural number arrangement, prime number attribute and factor
structure issues based on the sieve table. This kind of problem, though the form is very elementary, but it is not easy. In fact, because the current inability to grasp the complex law and character of natural number formation, there are still many unresolved problems, such as the Goldbach conjecture, prime discriminant problem, etc. From the process of the arrangement of natural Numbers, the prime attributes, and factor structure in this paper, it involves calculations of the distribution numbers of the composite number, the prime number, and same factor corresponding and different factor corresponding number distribution, factor cycle distribution, factor combination form, composite number corresponding sum, prime number corresponding sum and many laws and properties. Especially the model ordinal number law application, it is not isolated in a mathematical operation process. It follows the law of a connection between each other, exists in the whole order form of natural number set. In addition, the product of factors is not the same law as that of the output number. The distribution of the output number is a dominant law, while the distribution of prime Numbers is a hidden law. The output number value can be regarded as a representation of the composite number, but the composite number cannot be regarded as the numeration value. Because the product formula of its factor or factor does not have the law of its expressiveness. In a word, we can understand the complex nature of natural Numbers at a deeper level after exploring the distribution rules, corresponding forms and relationships among factors in even Numbers.

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