Distribution image of prime numbers in natural numbers

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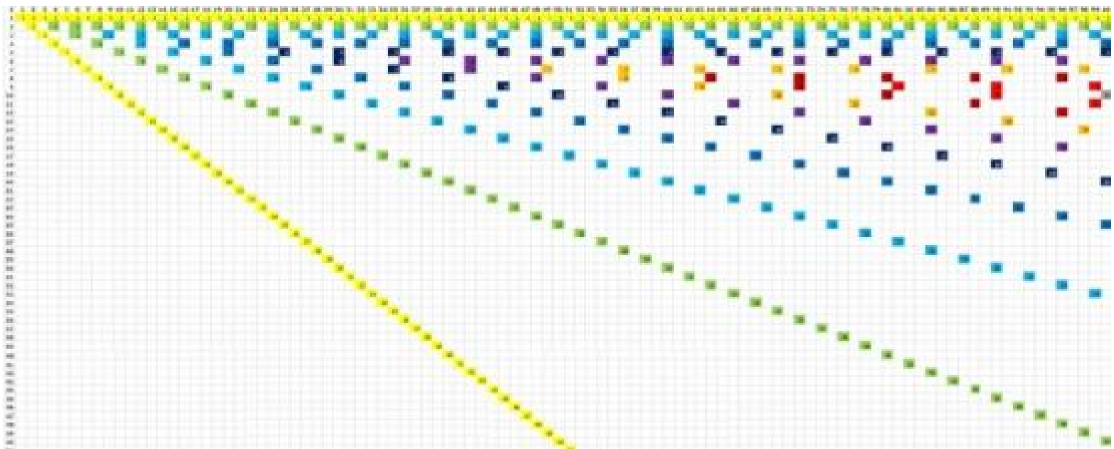
Abstract: This paper presents a method for drawing an image of the distribution of prime numbers in natural numbers.

Key words: Image of prime distribution, prime, natural number.

The method of drawing an image of prime number distribution involves the following steps: 1. draw a plane coordinate system and write numbers on the number axis; 2. arbitrarily select a coordinate axis and draw lines parallel to another coordinate axis based on the points with numbers on this coordinate axis; 3. draw infinite points on the parallel lines based on the points on this coordinate axis and the values of the numbers on this coordinate axis as intervals on each parallel line; 4. erase the slash with an angle of 45 ° with the coordinate axis; 5. on another coordinate axis, find the numbers on the aforementioned coordinate axis. If no corresponding point exists for a number, then the number is prime. If a corresponding point exists, then the number marked by this corresponding point is its divisor; 6. to find all the divisors of this number, redraw the 45 ° slash that has been erased.

The prime distribution drawn should be similar to the following image. The color mark in this image is another way of express the distribution. Interested researchers can study this independently.



In addition, the following equation can be extrapolated from the image:

1, S is a positive integer; p_k is a prime number; $n_k \to \infty$; $\Rightarrow \prod_{k=1}^{\infty}({p_k}^{+s*n_k}) = \prod_{k=1}^{\infty}[\frac{({p_k}^{+s*(n_k+1)}-1)}{({p_k}^{+s}-1)} / \frac{({p_k}^{-s*(n_k+1)}-1)}{({p_k}^{-s}-1)}] = \frac{\sum_{m=1}^{\infty}(m^{+s})}{\sum_{m=1}^{\infty}(m^{-s})}$.

We know that any natural number can be expressed as the product of prime numbers, similar to the following form: $m = \prod_{k=1}^{h}({p_k}^{n_k})$. Then, if the arrangement order is ignored, that is, any natural number corresponds to the arrangement and is a combination of the products of prime numbers, then all the permutations and combinations of prime numbers correspond to all natural numbers one-to-one manner.

Thus, we know

that $\prod_{k=1}^{\infty}\frac{(p_k{}^{+s*(n_k+1)}-1)}{(p_k{}^{+s}-1)} =$

$\prod_{k=1}^{\infty}(p_k{}^{+s*(0)} + p_k{}^{+s*(1)} + p_k{}^{+s*(2)} + p_k{}^{+s*(3)} + p_k{}^{+s*(4)} + p_k{}^{+s*(5)} + p_k{}^{+s*(6)} + \cdots)$.

Then, we observe that this product is completely disassembled into the form of addition, ignoring the arrangement order and adding any arrangement and combination of all primes.

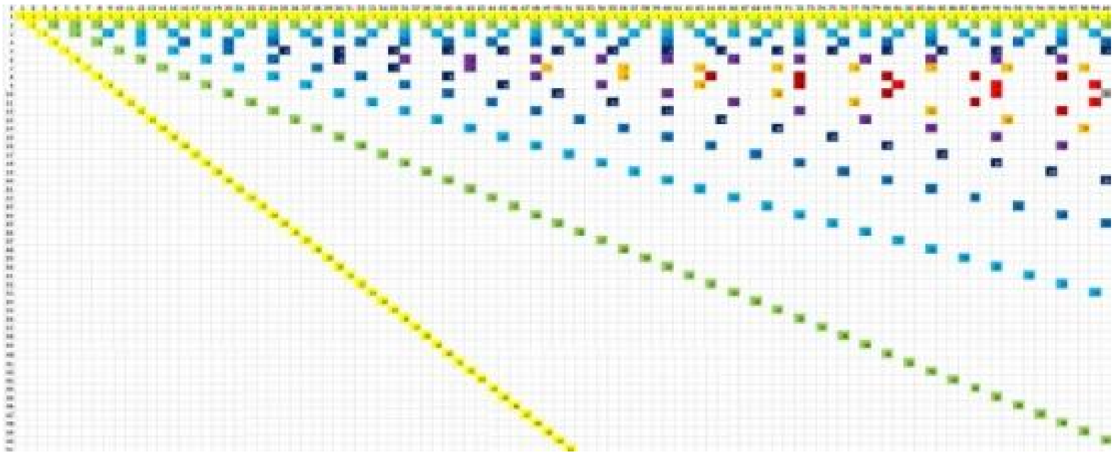
Thus, $\prod_{k=1}^{\infty}\frac{(p_k{}^{+s*(n_k+1)}-1)}{(p_k{}^{+s}-1)} = \sum_{m=1}^{\infty}(m^{+s})$, $\prod_{k=1}^{\infty}\frac{(p_k{}^{-s*(n_k+1)}-1)}{(p_k{}^{-s}-1)} = \sum_{m=1}^{\infty}(m^{-s})$.

We know that any natural number is equal to the sum of all its divisors divided by the sum of the reciprocal of all its divisors. Hence,

S is a positive integer; p_k is a prime number;, $n_k \to \infty; \Rightarrow \prod_{k=1}^{\infty}(p_k{}^{+s*n_k}) = \prod_{k=1}^{\infty}[\frac{(p_k{}^{+s*(n_k+1)}-1)}{(p_k{}^{+s}-1)} / \frac{(p_k{}^{-s*(n_k+1)}-1)}{(p_k{}^{-s}-1)}] = \frac{\sum_{m=1}^{\infty}(m^{+s})}{\sum_{m=1}^{\infty}(m^{-s})}$.

Next, if we ignore the order of arrangement and write any natural number, all its divisors have a unique arrangement.

Finally, if we arrange the common divisors of all natural numbers in one line and arrange all natural numbers in the natural order, the following image is obtained. The image shows the distribution of prime numbers in natural numbers.



Reference: none.