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THE EQUATIONS, DIVIDING THE NUMERICAL SERIES ON SERIES OF PRIME AND COMPOUND NUMBERS

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Is there any regularity that determines the place and the quantity of prime and composed numbers? Today this question has no answer. Some people consider that distribution of prime and composed numbers obeys no regularity. The others do not admit this. Bernhard Reaman (1826-1866), a well-known German mathematician, was among the latter ones. He set up a hypothesis that prime numbers are zeroes of dzeta function. That hypothesis has been remained unproved since 1859. Its proof would mean that the distribution of prime numbers is not chaotic, but regular. This question continues to excite the scientific world. It has received the name of the problem of the millennium.

The authors of this work succeeded to find out a wonderfully simple solution. It is so simple that the understanding of it can be gained even by a reader, who is not familiar with the theory of complex variable function and problems, associated with dzeta function.
Let's consider series of natural numbers

$$2,\ 3,\ 4,\ \ldots,\ n \quad (1)$$

In the form of vector:

$$r_i = i,\quad 2 \le i \le n \quad (2)$$

where n any number of series.
Is it possible to make the equations, dividing this series on series of prime and compound numbers? If yes, then it is necessary to recognize that the distribution of prime and compound numbers is not chaotic, but submits to the laws, which are expressed by the made equations.
From the series (2) we shall remove all the compound numbers, represented as product of integers *j*, *k*

$$j \cdot k\ , \quad (3)$$

where $2 \le j,\ \ 2 \le k$. Because of the symmetry of the product (3) relatively *j*, *k*, it is possible to write the specified bottom limits as

$$2 \le j,\quad j \le k\ . \quad (4)$$

Let's determine the top limits for numbers *j*, *k*.
The greatest value of the product (3) is limited to the condition

$$j \cdot k \le n\ . \quad (5)$$

If the number *n* is compound, then the sign of equality takes place in this condition. If the number *n* is prime, then the sign < takes place in it. The condition (5) allows specifying the top limit for *j*. Obviously, on this condition, *j* has the greatest value at the least value of *k*. Having substituted in (5) the bottom limit for *k* from (4), we shall receive the expression for the determination of the top limit of *j*

$$j \cdot j \le n\ .$$

Taking into the account the integrity of *j*, we have

$$j \le \left\lfloor \sqrt{n} \right\rfloor . \quad (6)$$

The condition (5), written as

$$k \le \left[\frac{n}{j}\right], \quad (7)$$

determines the top limit for *k*.
Let's write now the condition (4) with the top limits, determined in (6) and (7)

$$2 \le j \le \left[\sqrt{n}\right], \quad j \le k \le \left[\frac{n}{j}\right]. \quad (8)$$

Thus, all compound numbers of the series (2) are determined as the product (3), where the values *j*, *k* satisfy to the condition (8).
If we shall equate to zero all the compound numbers of the series (2), there will stay only the prime numbers. It can be made by the equations:

$$p_i = i, \;\; 2 \le i \le n$$
$$p_{j \cdot k} = 0, \;\; 2 \le j \le \left[\sqrt{n}\right], \;\; j \le k \le \left[\frac{n}{j}\right] \quad (9)$$

If in the series (2) we shall equate to zero all the prime numbers, determined by the equation (9), then there will stay only the compound numbers. The series of compound numbers can be formed without the addressing to the equation (9), i.e. irrespectively of whether the series of prime numbers is determined or not. It can be made through the equation:

$$d_i = 0, \;\; 2 \le i \le n$$
$$d_{j \cdot k} = j \cdot k, \;\; 2 \le j \le \left[\sqrt{n}\right], \;\; j \le k \le \left[\frac{n}{j}\right]. \quad (10)$$

The vectors (9), (10) have the same definiteness, like, for example, the vector (2) has. Consistently giving *i* values from 2 up to *n*, it is possible to determine the consecutive elements of the series (2).
The similar situation is with the vectors (9) and (10). The consecutive elements of these vectors are determined by the consecutive values of one variable *j*. How to carry out such calculations? Manually, by computer, or in some another way? It is feasible to do so, and, nevertheless, by the other means. Fundamentally here is that the distribution of prime and compound numbers submits to the equations (9), (10)! These equations we shall name as the equations of Jakypbekov-Duishenaliev.

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p(n) := | for  i ∈ 2.. n
        |   a_i ← i
        | for  j ∈ 2.. √n
        |   for  k ∈ j.. n/j
        |     a_(j·k) ← 0
        | a

d(n) := | for  i ∈ 2.. n
        |   a_i ← 0
        | for  j ∈ 2.. √n
        |   for  k ∈ j.. n/j
        |     a_(j·k) ← j·k
        | a

bl(n) := | for  j ∈ 2.. √n
         |   for  k ∈ j.. n/j
         |     a_(j·k) ← j · k
         | a_n ← 0  if  last(a) < n
         | for  i ∈ 1,4.. last(a) − 3
         |   | b_(i+1) ← (i + 1) · (a_(i+1) ≠ i + 1) · (a_(i+3) ≠ i + 3)
         |   | b_(i+3) ← (i + 3) · (a_(i+1) ≠ i + 1) · (a_(i+3) ≠ i + 3)
         | b
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The abovementioned functions $p(n),\ d(n),\ bl(n)$ are made in system MathCAD via the equations (9), (10), and determine prime, compound numbers, and also prime numbers-twins accordingly. As *n* we can take arbitrary large number. Let $n = 31$

$$p(31)^T = (0\ \ 0\ \ 2\ \ 3\ \ 0\ \ 5\ \ 0\ \ 7\ \ 0\ \ 0\ \ 0\ \ 11\ \ 0\ \ 13\ \ 0\ \ 0\ \ 0\ \ 17\ \ 0\ \ 19\ \ 0\ \ 0\ \ 0\ \ 23\ \ 0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 29\ \ 0\ \ 31)$$

$$d(31)^T = (0\ \ 0\ \ 0\ \ 0\ \ 4\ \ 0\ \ 6\ \ 0\ \ 8\ \ 9\ \ 10\ \ 0\ \ 12\ \ 0\ \ 14\ \ 15\ \ 16\ \ 0\ \ 18\ \ 0\ \ 20\ \ 21\ \ 22\ \ 0\ \ 24\ \ 25\ \ 26\ \ 27\ \ 28\ \ 0\ \ 30\ \ 0)$$

$$bl(31)^T = (0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 5\ \ 0\ \ 7\ \ 0\ \ 0\ \ 0\ \ 11\ \ 0\ \ 13\ \ 0\ \ 0\ \ 0\ \ 17\ \ 0\ \ 19\ \ 0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 0\ \ 29\ \ 0\ \ 31)$$

Here too, it's possible to take as *n* arbitrary large number.

The conclusion

Compound and prime numbers in the series (2) are arranged not chaotically. Their distribution is the subject to the law, expressed by equations of Jakypbekov-Duishenaliev. If any distribution is managed to be described by the equations, then it cannot be considered chaotic anymore, i.e. not submitting to any law.