Ø instead of 0

In mathematics there is a large number of paradoxes and exceptions associated with the number 0, such as: division by 0, logarithm with base 0, etc. These problems have serious problems in data analysis and research.

The solution to this problem is to exclude the number 0 from the number series (its removal) and replace it with Ø (empty set)

An empty set is a set that does not have a single element.

Why the empty set can replace 0 and it should not exist?

For example,

X = 5-5, then in the right part all values are reduced, instead of two numbers we should get an empty set Ø, and not another number, which is 0.

The possibility and implications of this change:

1. Ø+**a**=**a**, since we add **a** to the empty set, which is the absence of numbers, it means we add **a** to **nothing**. (the sum does not change from rearrangement of the places of the terms)

2. Ø-**a**=Ø+(-**a**)=-**a** , it follows that the difference of the empty set and **a** is a number **a**.

3. Ø*__a__=Ø, because,
Ø*__a__=Ø*(1+1+1+1…+1 [units in the sum of **a**])= Ø+Ø+Ø+…+Ø [add Ø to Ø in the amount of **a**-1 times]= Ø (consequence of the amount).

4. Ø/**a**=Ø, because,
Ø/**a**=Ø*(1/**a**)= Ø (consequence of the work).

5. a/Ø=Ø, since Ø is the absence of a result value, then dividing a number into an empty set will not give a result, which is the empty set (this is how the exceptions related to the number 0 are solved).

Replacing logical conditions (branching) with mathematical ones (remove if):

Very often, people have to fork out the execution of an action depending on different conditions. In mathematics in such cases, systems of equations, inequalities, etc. are used. If you think about it, it turns out that many of the mathematical, physical, chemical, and formulas of other exact sciences are systems of equations. For example, the formula for the sum of the first n terms of a geometric progression is:

$$S_n = \begin{cases} \sum\limits_{i=1}^{n} b_i = \frac{b_1 - b_1 q^n}{1-q} = \frac{b_1(1-q^n)}{1-q}, & \text{if } q \neq 1 \\ n b_1, & \text{if } q = 1 \end{cases}$$

In this case, the formula is branched into two parts: for q = 1 and for q ≠ 1.

What is the ramification of the formula for?
Ramification of the formula occurs in order to avoid dividing by 0 and get the right result, because if q is equated to 1 unit in the first equation of the system, then the denominator will be equal to 0 (1-1 = 0) - division by 0 will occur.
What are the downsides to this method?
This method cannot be used without the logical work of a person or an electronic computer, i.e. you must first examine the value of all variables, then choose the appropriate formula (equation) for a given condition, you need to know not one formula (equation) of the system, but all - there is no single formula (equation) for all conditions.
To solve this problem, you need a formula (function) that returns the values 1 (perform an action) or 0 (do not perform it).
To ensure that a variable equal to 0 equates to 1 without various checks, and a variable unequal 0 equals to 0, we need to raise any number (except 0 and 1) to the power of the necessary variable in the modules and divide it with the remainder by that number.

Formula: $k=z^{|k|}\%z$

Evidence:

Any number in degree 0 is 1, and the remainder of dividing 1 by any number (except for 0 and 1) is also 1, and for any other degree, the remainder of dividing is 0.

The formula for the sum of the first n terms of a geometric progression (using this formula as a function)

n is the number of figures.

b is a geometric sequence.

S n is the sum of the first n members of the geometric sequence.

z is any number except 1 and 0.

q is denominator of progression

% is remainder of the division

$$S_n=\frac{\boldsymbol{b1*(1-q\hat{}n)+b1*n*(z\hat{}(1-q)\%z)}}{\mathbf{(1-q)+z\hat{}(1-q)\%z}}$$

Evidence:
If q=1, then $z\hat{}(1-q)\%z=1$ => $S_n=b1*n$
If q is not equal to 1, then $z\hat{}(1-q)\%z=0$ => $S_n=\frac{b1*(1-q\hat{}n)}{(1-q)}$

To work with floating point numbers:

$\mathbf{k=z^{|k|}\%z,}$ replace with:

$\mathbf{k=z^{|trunc(-|k|)|}\%z,}$

where **trunc** – leave only the whole part.

The representation of an array of numbers as a single number

One of the main difficulties in working with combinations is the number of figures. After all, even 5 numbers can be represented by 120 different combinations. In order to reduce the number of numbers and maintain the accuracy of our work for all numbers in the array (not / or taking into account their positions), we can use the property of mathematical progressions with an increasing difference between the members of these progressions, which says that the sum of two members of mathematical progressions with increasing difference (geometric progression, etc.) is unique.

Let us analyze the formula on the example of the Fibonacci progression, where the progression receives this property, starting with the 3 members of the progression:
The formula for the Fibonacci numbers:
F (n) - the function of determining the Fibonacci number by its number.
x is the number 1 of the Fibonacci number.
y is the number 2 of the Fibonacci number.
z is a unique number

z=F(x+2)+F(y+2)

Proof of property:
To prove the work of property, we will use "proof by contradiction."
Suppose that F (x) + F (y) = F (e) + F (k), provided that they are not equal.

Imagine that the highest number of a number in the Fibonacci sequence is y, then F (e) + F (k) must be greater than F (y).
Why is this impossible?
The maximum sum of two Fibonacci numbers, which by their number in the sequence is less than y, is equal to F (y) itself, but not greater than it.
Example of use:

Given the numbers - 1,2,3,4

The task is to present pairwise permutations of a given array of numbers as a single number (do not take into account the position of numbers in the array).

$F(1+2)+F(2+2)=3$

$F(3+2)+F(4+2)=8$

$F(3+2)+F(8+2)=37$

Since the sum does not change from the permutation of the places of the terms, then pairwise permutations of these numbers will give us the same result. It is worth considering that 1 3 2 4 and 1 4 3 2 are not pairwise permutations. As a result, we can replace all combinations of paired permutations of these numeric elements with the number 37.