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Your assertion that none of these disturbing things are in conflict with the rest of mathematics is questionable. As G. Koenig already knew in 1905, there are only countably many names or "marks". Therefore it is impossible to put a mark on every element of an uncountable set. But without a mark for identification: What is such an element? Even Cantor stated (1906, in a letter to Hilbert) that objects without a finite definition are "Undinge" (the meaning lies between non existing things and nonsense).

The problem can be explained as follows: If we write the list of all finite definitions (words) in binary form

0
1
00
01
10
11
000
...

then that list contains all words we can say in some language A over a finite alphabet B based on a dictionary C.

The set of all A is countable, the set of all B is countable, and the set of all C is countable. Therefore we can put all meanings of all finite words of A*B*C into one single list (as Cantor showed for the related case of all rationals, i.e., by Cauchy-diagonalisation). And if some further features D, E, F, ... of languages should be discovered later, the cartesian product A*B*C*D*E*F... would also be a countable set.

Therefore it is impossible to identify all real numbers let alone all elements of a set of, say, cardinal number aleph_5.

In my opinion that is a severe problem. Of course every subset we choose will have a first element. But can we choose every subset? Are there all real numbers readily available to act as a first element? How should they be named and chosen?

Regards, WM

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answered **2 days ago**