

Re: Relative Cardinality

Source: <http://sci.tech-archive.net/Archive/sci.math/2005-07/msg01000.html>

- *From:* "Proginoskes" <proginoskes@xxxxxxxxxxxxxx>
 - *Date:* 7 Jul 2005 22:08:47 -0700
-

mueckenh@xxxxxxxxxxxxxx wrote:
> Proginoskes wrote:
>> mueckenh@xxxxxxxxxxxxxx wrote:
>>> Randy Poe wrote:
>>>> mueck...@xxxxxxxxxxxxxx wrote:
>>>>> As this would lead to strange results like $\text{Card}(N) =$
>>>>> $\text{Card}(\{\text{Primes}\})$,
>>>>
>>>> Of course, $\text{Card}(N)$ does equal $\text{Card}(\text{Primes})$.
>>>>
>>>> Does WM think there is a natural number n such that the
>>>> n -th prime does not exist?
>>>>
>>> Yes, it is so. I am not sure, whether sequences like 111...111 with n
>>> 1's or like $10^{2n} - 10^n + 1$ do ever cease to supply primes now and
>>> then.
>>
>> That is an irrelevant comment, because there are prime numbers which
>> are not of that form (like 2).
>
> It is no irrelevant but you have not yet understood my arguing. I
> mentioned these numbers because numbers of that form (111...111)
> definitely do exist. Pot. infiniteley many! If there are always some
> prime numbers among them, then pot. infinitely many prime numbers can
> be raised into existence too. Nevertheless we can never count up to
> $10^{10^{100}}$, and, therefore, we cannot determine the $10^{10^{100}}$ -th prime
> number – irrespective of how many can be found.

Let me digress for a moment:

Lemma. If we can't count up to N , then we can't count up to $N-1$.

Proof: This statement is equivalent to: If we can count up to $N-1$, then we can count up to N . This is trivially true.

WM's Axiom. We can't count up to $10^{10^{100}}$.

Theorem: We can't count up to any number.

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Proof: Use the lemma, with backwards induction, to arrive at the statement: We can't count up to 0. This means that we can't even start counting, so "counting" is a meaningless task (and impossible, to boot).

> > Er ... Euclid proved that there are an _infinite_ number of primes.
>
> Euclid did not talk of infinity. There are more than any given number,
> he said.

That's what infinity means. Actually, he didn't say, "There are more than any given number," because he didn't know English.

> > What do you find wrong with that proof?
>
> Do you really think it necessary to demonstrate such things here?

That's not what I asked. I asked what YOU found wrong with that proof.

Since in your post, you weren't sure about whether there were "infinitely many" primes, and I figured you must have surely seen the proof, I decided that you had some trouble with one of the steps of the proof.

The only other reasonable conclusions I could come to are that you are uninformed, stupid, or insane. I decided to give you the benefit of the doubt.

> Recently we had a proof that $\sqrt{2}$ is not rational. We should
> concentrate on more general problems: It is impossible to label more
> than 10^{100} entities by all particles the universe supplies.

If that's what you've really meant, then you should have said so, instead of wondering about whether numbers of the form 111...111 give you infinitely many primes, since you won't be able to write them down anyway.

Mathematics was designed to work outside of the physical universe.

> Therefore
> there cannot exist a set with more than 10^{100} elements and we cannot
> count up to $10^{10^{100}}$.

Well, this will make life much more difficult for you as a physicist, since physics uses lots of statistical mathematics (which allows sets of arbitrarily large size, even sets of size $10^{10^{10^{10^{10^{10^{100}}}}}}$) to make certain calculations easier.

--- Christopher Heckman

• *Follow-Ups:*

- ◆ **Re: Relative Cardinality**
◇ *From:* mueckenh
- ◆ **Re: Relative Cardinality**
◇ *From:* Jiri Lebl

• *References:*

- ◆ **Re: Relative Cardinality**
◇ *From:* mueckenh
- ◆ **Re: Relative Cardinality**
◇ *From:* Virgil
- ◆ **Re: Relative Cardinality**
◇ *From:* mueckenh
- ◆ **Re: Relative Cardinality**
◇ *From:* Dik T. Winter
- ◆ **Re: Relative Cardinality**
◇ *From:* mueckenh
- ◆ **Re: Relative Cardinality**
◇ *From:* Randy Poe
- ◆ **Re: Relative Cardinality**
◇ *From:* mueckenh
- ◆ **Re: Relative Cardinality**
◇ *From:* Proginoskes
- ◆ **Re: Relative Cardinality**
◇ *From:* mueckenh

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