Re: INFINITY Revisited

Source: http://sci.tech−archive.net/Archive/sci.math/2005−09/msg00518.html

- *From*: "Don Whitehurst" <whit0911@xxxxxxx>
- *Date*: 2 Sep 2005 16:50:43 −0700

I apologize for not responding sooner, my computer lost its connection
to the internet.

Dave Seaman wrote:
> >> Why is it impossible to add all the finite−numbered balls without also
> >> adding a ball marked aleph_0?
>
>
> > Before noon each nth interval is represented by a natural number and
> > since there is no largest natural number at any time before noon (nth
> > interval) additonal balls always remain to be added and to be removed.
>
> This does not answer the question. Why is it impossible to add all the
> finite−numbered balls without also adding a ball marked aleph_0?
>

My response answered the first part of the why all the balls could not
be added to the vase before noon which I thought should be adequate for
the answer; but apparently not.

Since there is no last (n+1)th interval that is 1/2 of the time
remaining from 1/(2^n) minutes to noon just as there is no last
natural, there is no last time of addition for the balls. Only by
noon, the at actual infinity was it possible to add the all the balls
which must include those with an infinite number of digits as well.

I treated the time noon as being infinity and used aleph_0 only because
you said that aleph_0 was the name of infinity for the naturals. I
don't think I said there was a ball marked aleph_0 added. But it may be
a proper inference from what I did say.

At noon I think there are an infinite number of balls added all having
decimals each with no last digit printed on them (perhaps this is only
aleph_0 balls but I think it may be 10^ aleph_0 balls but I am just
learning these concepts). It seems to me that any decimalic number
with no last digit must be either a repeating rational or an irrational
number. If there are decimalic numbers with no last digit that are not
a repeating rational or irrational number, please provide a me with an
example of such a number.

> >> Where do you see a paradox? And why add assumptions that are not present
> >> in the problem statement?
>
>
> > The paradox arises from the statements 1) and 2):
> > 1) Every ball added to the vase at the nth interval before noon will be
> > removed before noon (at some later (n+ r_kl)th interval).
> > 2) Before noon, at the nth interval, whenever the nth ball is removed,
> > there are 10^n −n balls remaining in the vase.
>
> That may seem paradoxical to you, but it is not a contradiction.
>

I tried to bring 1) and 2) closer by making the statements more specific − apparently too close. Let me try rephrasing these and add another.

1) Every ball added to the vase before noon will also be removed before noon.
2) After the first balls are added there are always balls remaining in the vase.
3) At no time before noon is the vase empty.

With the proper understanding regarding statement 1); namely, that only a portion of balls remaining are removed at anytime before noon and that statements 2) and 3) follow as a consequence of the fact that the addition and removal process has no ending before noon − you are correct that these statements, which on face seem paradoxical, are not contradictory.

> >> > Does the infinite digit string forming the number "0.01002000300004..."
> >> > exist as a real number?
>
> >> Any digit string that contains a decimal digit at digit position n for
> >> each natural number n is a representation of a real number.
>
>
> > So does this mean that all of the infintesimals 0.000...1 through
> > 0.000...n the limit point of the sequences 0.1, 0.001, 0.0001, ...
> > through 0.n, 0.0n, 0.00n, ... respectively are also a real numbers all
> > taking the value zero? I thought these were not real numbers.
>
> Those are not real numbers. They are character strings.

I didn't think they were real numbers but I thought they met your definition (which I believe may be a simplified description relative to the Dedekind cuts and Gauchy sequences about which you have been teaching me).

What is the difference between a digit string and a character sting?
How do the infintesimals 0.00...01 not meet the meaning of a "decimal
digit at digit position n for each position n"? Is it because there is
no last n in the naturals?

> You haven't
> explained what they are supposed to mean.
>

I don't understand this question. I am not sure what most irrational
numbers mean or even how they are obtained. These infintesimals were
the limit points of the sequences such as 0.1, 0.01, 0.001, ..., ...
and 0.2, 0.02, 0.002, ..., ... and includes 0.23, 0.023, 0.0023, ...,
.... and in general 0.n, 0.0n, 0.00n, ..., ... for all n. I am not
trying to develop infintesimal math, I assume from your and Peter
Webb's responses that such numbers have been studied. Nevertheless, it
is clear as I presented them each successive number in the sequence is
1/10th the value of the previous number. As an aside, this may be
analogous to the time being reduced by 1/2 for each successive
interval. These sequences arose from the way I numbered balls in order
to include values less than 0.1. The limit points 0.00...01 through
0.000...0n (all equal to zero) arise as this sequence approaches
infinty in a similar manner as the limit point 0.333... arises from the
sequence 0.3, 0.33, 0.333, ...

<snip>

>
> > NTON =
> >
0.010011200011122230000111122223333400000111112222233333444444500000011111122222333333444444555
>
> > FACTND=
> >
0.112112321312231213132123432143124231421341324123342134123241321431423124243124132341231421432
>
> There are no infinitesimals here.
>
> > The infinite decimalic number above arises from taking factorials of
> > digits associated with each "n" arranged in descending order and
> > appending them to the decimal as in a sequence. This is shown in more
> > detail below. The number of added digits with each n is much larger
> > than 2^n.
>
> The details are not important. These are ordinary real numbers. Each is
> defined by an ordinary infinite series.
>
>
> > The mapping by the naturals of the infinite representation of decimalic
> > numbers NTON and FACTND seems to require going "through" at least an

> > infinte number of digits each natural number n. These don't seem like
> > real numbers to me. Furthermore, if the naturals can map the infinite
> > digit strings associated with NTON and FACTND I really don't understand
> > how they cannot map the reals?
>
> The mapping that you described earlier does not include these numbers,
> because your mapping covers only the reals that have terminating decimal
> representations. A number such as 1/3 = 0.3333... does not appear among
> the values represented by your mapping.
>

If by the mapping you are referring to the problem with the balls being added before and the question being asked by noon, I disagree.

If you are referring to the mapping with columns that I presented in an earlier post and for which I was recently being questioned by Stephen, I agree that the representation in columnar form was poor particularly since it did not even show pi.

Let me try to improve the representation (using rows instead of columns) to better show what I intended with the mappings.

E) 0, 0.3, 0.33, ..., 0.33..(3_n), ..., 0.33...(3_n)... as n => oo

^ ^ ^ ^ ^ ^ ^
| | | | | | |

D) 0, 1, 2, ..., n, ..., ... as n => oo

^ ^ ^ ^ ^ ^ ^
| | | | | | |

C) 0, 0.3, 0.33, ..., 0.33...(3_n), ..., 0.33...(3_n)... as n => oo

^ ^ ^ ^ ^ ^ ^
| | | | | | |
\ _____ |
\ \ |
B) 0, 3, 3, ..., d_n(n <− d_dec1/3), ..., ... as n => oo

^ ^ ^ ^ ^ ^ ^
| | | | | | |

A) 0, 1, 2, ..., n, ..., ... as n => oo

Where d_n(n <− d_dec1/3) is the nth digit of this digit string that arises from the nth digit to the right of the decimal point of the decimalic expression for 1/3 which is 0.33....

Where (3_n) represents the nth digit of 0.333....

Where 0.33...(3_n) is the finite decimal approximation to 0.333... with n digits to the right of the decimal point.

Where 0.33...(3−n)... = 0.333... = 1/3. I believe the number 0.333... where there is no last digit of the decimalic expression is the number 1/3 which coincides with the observation that unity (the whole) cannot be evenly subdivided into three parts; there is always a remainder.

I don't see how the mapping shown above (which includes mapping the infinite number of naturals to the decimalic numbers based on 0.333...) does not include 0.333... which has no last "3" as n => oo.

Don Whitehurst

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- ***Follow−Ups***:
  - ♦ ***Re: INFINITY Revisited***
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  - ♦ ***Re: INFINITY Revisited***
    - ◊ *From:* Dave Seaman

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