Re: infinity

Source: http://sci.tech−archive.net/Archive/sci.math/2005−08/msg05538.html

- *From*: "Gordon Collins" <poster02@xxxxxxxxxxx>
- *Date*: 28 Aug 2005 10:53:45 −0700

Stephen wrote:

> What explanation would you accept?

One that /shows/ the completion of an infinite iterated (i.e., discrete) procedure would do.

> There
> is no step at which the vase becomes empty, but who says
> there has to be such a step?

It follows from the problem statement that any change to the vase occurs as a result of a step.

But there seems to be some question as to whether the problem as posed really consists of specific /steps/ at all, as many are willing to consider each ball independently with only coincidental (and entirely dispensable) synchrony. If one interprets the problem in this way, there is nothing strange left of the problem but there is little point to it.

> However
> there is a mathematically sensible way to talk about
> an infinite process "ending".

I would like to see a mathematical description of an infinite discrete process ending. All I have seen is statements to the effect of, "well, it /must/ have finished by now", with the details of how it did so lost in a haze of implied epsilons and deltas.

> Of course you have to reach noon.

Why? As long as we're ignoring physical reality, we can ignore the usual passage of time. Time can pass from −1 toward 0 and not get there just as easily at it can pass from 1 toward +oo and not get there. [−1,0) and [1,+oo) have the same cardinality, topology, etc.

(This isn't what stops you, of course − it's the discrete iteration
that does that.)

Standard Analysis doesn't care and in fact /cannot/ deal w/ time as we think of it. There's an expectation that there is something, call it "clock", that is going to "run", passing −1, −1/2, −1/3, ... along the way − firing off whatever actions are to be done at those times − and continuing past 0 = noon. But this requires "clock" to be a variable (not a /sequence/, but an honest−to−goodness /variable/, a scalar whose value changes) that takes on each real value in turn from −1 to 0, in the natural order. But reals don't have successors. There can be no such mathematical "clock".

Calculus gets around this by defining sequences and using limits to extrapolate over them. The epsilon/delta technique glosses over the problem of "ending" the sequence "as t approaches 0". (I put the last in quotes to emphasize that it is only linguistic shorthand.) It works great for analyzing smooth processes over smooth time − real−world applications − but gets pathological when you try to treat a line as already infinitely subdivided.

> Suppose you walk across a 10 meter room starting at time 0 moving
> at 1 meter per second. Assuming time and space are continuous, at time 5,
> you will pass point 5. At time 7.5, you will pass point 7.5. At time
> time 8.75 you will pass point 8.75, etc. And at time 10 you will
> pass point 10, even though there was no last point before point 10,
> and even though you passed an infinite number of points along the
> way.

I do not pass any "points". When I move from one place to another 10 meters away, I do not take a 5−meter step, then a 2.5−meter step, then a 1.25−meter step, etc. Nor is there such thing as a fractional step to correspond with your (and Zeno's) arbitrary, artificial divisions.

> If you claim this is absurd, then you must not believe
> that time and space are continuous.

Quite the opposite − I take both motion and the passage of time as seamlessly continuous. I do not mean epsilon−delta−continuous here − /nonpunctiform/ is the correct term, I believe. Since I do not pass an infinite number of points (an idea that is indeed absurd), I have no problem getting around.

Time may be discrete or continuous, but if the latter it must be a proper continuum, free of the crippling need to move from point to point in succession.

Consider this reformulation of the problem that moves the vase instead

of the balls:
Define f(t) = 10*floor(−1/t) for −1/n <= t < −1/(n+1).
Define g(t) = floor(−1/t) for −1/n <= t < −1/(n+1).
Define In as the region between f and g.
Define the vertical line Vase as: t = −1.
Define Count(t) = as number of points w/ integral y coordinate that are in the intersection of Vase and In.
Now imagine the line Vase at positions progressively farther in the positive direction of the t axis. It is clear that lim{t−>0}Count = oo.

At 0, Vase is the line t = 0, and its intersection with In is the empty set and Count = 0. There's nothing even counterintuitive about this.

BUT...

How do you imagine the vertical line moving?
If it moves in steps, −1, −1/2, −1/3, −1/4, ..., then 0 is not reached even though it's out there as the LUB.
If it moves smoothly then t cannot be defined using the reals and you can't do everything that was asked. You lose the infinite subdivision that got you all the points −1/n. You can either cut up a line segment into points or traverse it, not both.

Gordon

.

- ***Follow−Ups***:
    - ***Re: infinity***
        - *From:* stephen
- ***References***:
    - ***infinity***
        - *From:* Theo Jacobs
    - ***Re: infinity***
        - *From:* stephen
    - ***Re: infinity***
        - *From:* aeo6
    - ***Re: infinity***
        - *From:* stephen
    - ***Re: infinity***
        - *From:* aeo6
    - ***Re: infinity***
        - *From:* stephen
    - ***Re: infinity***
        - *From:* aeo6
    - ***Re: infinity***

- ◊ *From:* stephen
- ♦ ***Re: infinity***
  - ◊ *From:* aeo6
- ♦ ***Re: infinity***
  - ◊ *From:* stephen
- ♦ ***Re: infinity***
  - ◊ *From:* Gordon Collins
- ♦ ***Re: infinity***
  - ◊ *From:* stephen

- Prev by Date: ***Re: Bring Math Arguments against this FERMAT LAST THEOREM PROOF***
- Next by Date: ***Cardinality of Real Numbers***
- Previous by thread: ***Re: infinity***
- Next by thread: ***Re: infinity***
- Index(es):
  - ♦ ***Date***
  - ♦ ***Thread***