The Permutably Problematic Permutations of Reality

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What's Math?

Math is a logical construct or model created by man, much like our own language, and it only has meaning, because we attribute meaning to it. You can use a computer to do math and manipulate the symbols and equations, but a computer attributes no meaning to what it does. To do that, humans remain essential in the chain of command.

Imagine having the symbols "good" and "bad" programmed into a computer, without a human being telling the computer what to do. In a simplified universe a computer may determine through logic what's good and what's bad, but if we ask the computer to act, because it doesn't attribute content to the symbols of good and bad, it will act ambiguously.

If we want the computer to do good, not bad, we need to tell it to. We would have to do so through a programming language. It only has symbols, but not a concept of good and bad, meaning that to the computer good and bad are as equal as they are unequal.

We use math to test and prove or disprove our hypothesis within a simplified universe. That's one of the things also that we encounter in physics : if we want to solve a problem we need to simplify it, focusing on what matters.

We are somehow capable of discarding and as such disregarding the immensity of the universe and only focus on the most local part of it and within that even on fewer factors. Computers would have to test and set, eliminating every single occurrence in the universe, if they were to act like computers.

In practice through fuzzy logic, we tell the computer to be "a little less accurate," allowing it to generate an answer. This actually works really well with the computer being right in most cases. Very much in the same way that our own logic is sometimes still flawed, the computer through fuzzy logic will sometimes also make mistakes, but in the end in the fallible existence that we find ourselves in, it's more about being right as often as possible.

Often enough, as in always, just isn't manageable. We sometimes have to acknowledge that we don't know, and as such in some cases can't even act. Our perception of reality is sometimes too limited and as such not sufficiently complete. Math can't be complete either, but we can make it as complete as possible.

Popper and Sufficiency

Karl Popper in his “The Logic of Scientific Discovery” (chapter 3.15) argues that a logical system should consist of all of the assumptions needed, but no more. Such a system should be free from contradiction, independent, sufficient, and necessary. We have many systems that we perceive as such, but are we correct in assuming that these systems are complete?

Due to human psychology, we often think we perceive fixed limits that can’t be broken.

We felt in the past that there was a certain speed barrier in terms of how fast we can run, that was consequently broken by someone setting a new world record. More and more, we look for pushing these perceived boundaries, finding ways of establishing whether they really are or aren’t there.

Sometimes people cheat : they do doping and do things that no “ordinary” human being was assumed to be capable of. Sometimes people don’t cheat, but believe : my favorite example remains parkour training where soldiers learn to escape from seemingly impossible situations, freeing themselves against all odds.

In math we sometimes face problems that can be proven in the written word, meaning that we see that what we say logically holds and is evidence of truth. Yet we are unable to model it in math and show within our logical constructs that this evidence is correct.

It has taken me a while, but I’ve also had to come to realize that this means the mathematical system simply isn’t sufficient. It meets all three other criteria, but it simply isn’t sufficient.

In part, the use of multiple kinds of mathematical systems solves the problem of sufficiency : calculus, algebra, various forms of logic, etc. You could also merge all of these mathematical systems in a mathematical super-system. Essentially we already did this : it’s called math. (That’s actually a joke. It makes you laugh because it’s true. Accept it.)

Before there was mathematical logic, we devised language. Language allowed us to say that combining “if this is true then that is true” with “this is true” leads to us being allowed to deduce “that is true,” but we didn’t have the mathematical expression for deduction until someone wrote it down. Now we have :

[Eq. 0] $a \rightarrow b, a \vdash b$

Isn’t that wonderful? Based on the above it’s possible to come up with new logical and scientific systems that allow us to analyze what we see around us. Still people are going to find it hard to break through the limitations of our existing mathematical constructs and come up with a sufficiently large system of axioms.

Learning to break through this barrier means that scientists need mental training that allows them to explore new options. They need training that tells them to add something to the existing constructs of science if this may help us prove other hypotheses to hold or not to hold. How do you approach this kind of mental training?

Since the need has clearly been defined by Popper, what’s left is creating an angle, a point of view, that allows you to see yourself adding something to existing constructs of science that we have found to be in accordance with reality, so we can use this to further analyze and understand reality to greater depths.

This point of view can easily be summarized in a single rule governing the expansion of our scientific axioms or systems. It reads thus :

> If you can't prove a hypothesis in existing mathematics, but you can prove it in natural language, you have to introduce this evidence as a new axiom with a new rule and symbols into the mathematical construct so other evidence may be derived from it.

Not really a new rule. Essentially it's what we've always done, but I do think I'm the first to write it down and introduce mental training into science this way. This way other people will be able to learn to do so also. At least I can claim full credit for that... I hope.

Example : Proving Only One Permutation of a Sequence Can Exist

So you have a sequence of $N = n$ elements and you want to prove that only the sequence in the permutation as presented can work, how do you set about doing that? If you want to prove that no other sequence can exist, running through $n!$ permutations with an increasing number of n is going to be quite cumbersome.

Imagine having a 7-layered model : you would have to check $7! = 5040$ permutations. That's a lot of work.

In human language, it's easy to see that for every permutation different from the one presented to work, there will always be two elements that were previously directly before and after each other in the sequence, that will now be reversed. As such you only have to check $n - 1$ (in the example 6) sequence reversals, namely for every k and $k + 1$ with $0 \leq k < n$.

We all get that this is true, since in words this is clear and accurate evidence. Instead of saying that it can't be proven in mathematics, we should now add this as an axiom to mathematics. As such we get the following:

[Eq. 1] $$s = \langle s_0 , \ldots , s_{n-1} \rangle$$

[Eq. 2] $$|s| = n$$

[Eq. 3] $$(\forall k : 0 \leq k < n-1 \cdot \neg R s_k s_{k+1}) \rightarrow \neg(\exists q : 0 \leq q < n-1 \wedge \exists r : 1 \leq r < n \cdot q < r \wedge R s_q s_r)$$

In plain English, we have a sequence s. The sequence s has n elements. If for every element with counters k and $k+1$ you can't reverse the order of these two elements, then there is no element with counter q and no element with counter r, with q smaller than r, that allows you to reverse these two elements.

This is true because when you reverse elements with counters q and r, then there are also elements with counter k and $k+1$ that will be reversed. The math looks like this :

[Eq. 4] $$(\exists q : 0 \leq q < n-1 \wedge \exists r : 1 \leq r < n \cdot q < r \wedge R s_q s_r) \rightarrow (\exists k : 0 \leq k < n-1 \cdot R s_k s_{k+1})$$

Equations 1 through 4 together form the construct that we need for establishing further proof in permutations research. I should note that I made the equations as efficient as possible to reduce computing time, were they to be a part of a larger computing program.

Conclusion

The insufferable insufferableness of the verifiable verifiability simply doesn't exist. If we want to be able to comprehend the truth, we first need to come up with a linguistic construct that we do understand and that does allow us to see the truth, which we *than* (*not* archaic for "immediately after") readily need to translate to mathematics.

Only when we have both the linguistic and mathematical foundation that comprises of all of the axioms we see, may we be able to comprehend and derive truth and proof of that which we don't understand yet.

The search for science as such doesn't start with searching for what we don't know, it starts with acknowledging and noting what we do know. We use that to derive higher complexity in terms of logical, physical, psychological, and sociological systems. This has always been and shall always be a part of science, with treatise on dialectics and reason.

Go forth and assume that you don't know, acknowledge that every now and then you do know, and see where this may lead you. Dare to think, question, reason, and feel. Dare to live and explore. The world and universe change continuously, meaning that they will never truly be known to and understood by us, always leaving something new to be discovered.

Literature

Karl Popper (1959) "The Logic of Scientific Discovery" : Routledge Classics, NY.