BIG QUESTIONS
A PROGRAM OF THE NATIONAL SPEECH & DEBATE ASSOCIATION NATIONAL FORENSIC LEAGUE
SUPPORTED BY THE JOHN TEMPLETON FOUNDATION

Sample Affirmative Case

Shakuntala Devi, Native American writer and math scholar once said, “Without mathematics, there’s nothing you can do. Everything around you is mathematics. Everything around you is numbers.” From this, we can extrapolate that the universal constant to our world, what we see each day, what we experience, what we live, and what we come to know, and love is all based on the fundamental rules of math. Numbers guide us, determine how fast our crops grow, how where each raindrop falls, and as every debater knows, how many minutes you need to microwave your coffee to get it from cold to hot. Math is our lives. So, when we are faced with the question of Resolved: Mathematics was discovered, not invented, I must firmly stand in the affirmation. Today, I will first, provide some definitions and observations to clarify my belief, second, by explaining how math has always existed in nature, how math governs the universe without human intervention, and through the Mathematical Universe Hypothesis, I will provide you with three main points that support my belief, and finally, I will leave you with some parting words to think about as this debate moves on.

First, to set forth some basic definitions for this debate.

The term “invent” as defined by the Cambridge Unabridged Dictionary means “to originate or create as a product of one's own ingenuity, experimentation, or contrivance.”

The term "discover" as defined by the same dictionary means "to see, get knowledge of, learn of, find, or find out; gain sight or knowledge of (something previously unseen or unknown)."

Taken together, the resolution is asking us whether the field of mathematics was created as per some human's construction of ideas and work from nothing rather than whether the field previously existed and was learned about, observed, and then reported on and described. Going back to my opening quotations, math has always existed. It has governed our lives whether we were aware of this fact or not. A five-year old is not aware of complex geometry or the quadratic equation but these rules and formulas still govern their lives just the same. A similar example is that of a new species of snake that a team of researchers finds in the rainforests of some remote country. This species of snake has never been seen before by humans. Just because it has not been seen before does not mean that team of researchers invented it. It is not an iPad or a robot that was made after years of experimentation and crafting in a laboratory. Rather, the animal was found and observed. It had existed all along whether people realized this fact or not. In short, it was discovered. In a similar way, math, as a state of nature existed previous to people learning about it. Once people were aware of its presence, it was discovered.

Now that I have established my definitions for today's debate, I will move on to my case. My first contention is that math as a construct is and has always exited in nature.

In Douglas Adams' science-fiction novel and book, “The Hitchhiker's Guide to the Galaxy”, when the supercomputer is asked to calculate the meaning of life and the answer to what is the nature of the universe, after all of time, the answer was found to be 42. When asked to clarify, the computer replies that the answer is easy, the question is the hard part. When asked years later about this perplexing concept, Adams replied that the nature of the universe is already known, given the movement and position of every atom, we already know the nature of the universe. The hard part is finding the rules and formulas that united and govern us. They exist but they have yet to be found. Already, humans have started to unravel this matrix, albeit slowly. The same principles that lead to the discovery of the Higgs Boson were the same principles that were used to discover the planet Neptune which were the same principles that were used to design the aiming sights for early warship canons.

If you look around right now, you can probably spot a few numbers here and there. Because of our education system, many people equate mathematics with arithmetic. Yet mathematicians’ study abstract structures far more diverse than numbers, including geometric shapes. Do you see any geometric patterns or shapes around you? Try throwing a pebble and watch the beautiful shape that nature makes for the arc an impact. The trajectories of anything you throw have the same shape, called an upside-down parabola. When we observe how things move around in orbits in space, we

discover another recurring shape: the ellipse. These two shapes are related: the tip of a very elongated ellipse is shaped almost exactly like a parabola.

Humans have slowly discovered many additional recurring shapes and patterns in nature, involving not only motion and gravity, but also areas as disparate as electricity, magnetism, light, heat, chemistry, radioactivity, and subatomic particles. These patterns are summarized by what we call our laws of physics.

My second main point is that numbers are a universal constant. Equations aren't the only signs of math that are built into nature: there are also numbers. Unlike human creations like the page numbers in a book, numbers refer to the basic properties of our physical reality. For example, how many straws can you arrange so that they're all perpendicular to each other? Where did the number three come from? We call this number the dimensionality of our space, but why are there three dimensions rather than four or six or 23,443? There are also numbers encoded in nature that require decimals to write out. There's something mathematical about our Universe, and that the more carefully we look, the more math we seem to find. A perfect example of this is when we consider the “golden ratio” or phi. Phi can be defined by taking a stick and breaking it into two portions. If the ratio between these two portions is the same as the ratio between the overall stick and the larger segment, the portions are said to be in the golden ratio. This was first described by the Greek mathematician Euclid, though he called it "the

division in extreme and mean ratio," according to mathematician George Markowsky of the University of Maine.

You can also think of phi as a number that can be squared by adding one to that number itself, according to an explainer from mathematician Ron Knott at the University of Surrey in the U.K. This ration governs everything from the spiral on a snail's shell to the layout of a sunflower's seeds, to the distance between locations in galaxies. When scientists added this knowledge onto the preexisting knowledge of the ratio, the Universe seemed to line up and order appeared from chaos. In doing so, nothing was invented but rather, the principal for perfection was discovered.

My final main point is the mathematical universe hypothesis. Our known reality is like staring into a fog. Even if you have your headlights on, you can only see so far. Turn up the brightness and you actually make the depth of vision worst. In a similar way, reality functions as the fog. The observable reality that we know, and experience is only a short fraction of what exists in all of the universe. In some ways, the harder we try to see through this fog to know all of reality, the harder it becomes to actually see. That is where the Mathematical Universe Hypothesis comes in. In this model, the reality we know is the fog. Our vision is limited by our ability to see through it because, as humans, our senses only allow us to experience a tiny fraction of the known universe. However, we can know the state of matter on the other side of the galaxy, we can see the fading light from the Big Bang, and we can predict the motion of parents and other heavenly

bodies through our understanding of the math that governs them. Furthermore, this principle states that the intrinsic nature of math transcends every atom in the universe and that whether we are aware of it or not, it has and always will exist. Going back to the opening example, the new species of snake that was discovered did not just appear when the scientists became aware of it, but rather it had always existed and was found through observation. As per my definition of "discover" our act of observation separates our discover from that of an invention. Finally, the hypothesis posits that invention of the fundamental laws can't exist because in order for these laws to be found, they first needed to exist. Invention happens from a starting point of zero. A blank slate. When the rules that govern the universe are already set, there is no zero.

Today, we have looked at the very fundamental rules and laws that govern our universe. We have explored the ways in which math has governed our lives. We have looked at both the philosophical as well as the scientific justifications for the discovery rather than the invention of math. Because of this, I strongly urge an affirmative ballot. Thank you.