Trick or Truth: the Mysterious Connection Between Physics and Mathematics

I ought to admit that I was a little bit more than somewhat perplexed by most of the words in the title of the essay assignment.

Neither trick nor truth (nor their combination) seemed to be necessarily relevant except if that already were your take on it, and mysterious connection would only pertain if both the concept of mystery and connection had already been established.

Of course, the intent of the heading likely was (I can safely presume) to leave the topic as open as can be to allow for multiple approaches and to inspire diverse lines of thought, and hence the intentionally ambiguous wording.

Well, without further ado, it seems to me that mathematics for the most part deals with quantities. In some, relatively speaking, more recent kinds of math, particular properties are ascribed to certain terms that comprise it. It is fully analogous to what physics does. We posit the existence of certain (for lack of a more apt noun) qualities, and then use math to express a quantitative relation to something else.

Just look at any equation that is used by physicists. It states that whatever is on its left side is equal to an amount of another quality on its right side. No, it is not, despite what Randall claims, that ultimately everything is reducible to a number. The number 2 can equally apply to a particle's spin, but also to 2 degrees Kelvin, and to the two people in front of you at the checkout counter. The number 2 does not mean anything by itself. It needs context at minimum, and more ordinarily needs to be defined in terms of what it refers to.

It has to be two of something. And that something is not a number (or, at least, if you follow the logic, it ends up at a quality that is not a number). Without that quality it would be difficult to assign meaning to it.

And that something is what is so important to physics. The correct selection of somethings and the appropriate selection of the numeric relationship among such somethings is physics (in its proper state).

Math on its own is rather arbitrary if devoid of content (physics). It is merely an explicit statement of logic (logic itself being derived from our brains shaped by evolution – and therefore reflecting the rules of the universe). Math without consideration of whether it mirrors the outside world is always tautologic, because you get to make your own rules. Once it starts to purport to speak about the world, it becomes physics. At this stage, it can be validated (or not) by experiment, which is the final arbiter of whether your physics is right.

I don't expect to win many consenting opinions, and that is frankly not what I am after. I could not care less about money or fame (as the cliché goes). Even if I were to prove or disprove the Riemann Hypothesis, it would only serve to undermine the public's perception of genuine mathematicians who are far more talented than I.

So there you have it…

There is no mystery. Whenever you find a consistent (repeatable) observation, it automatically means that you can use math to make utilitarian sense of it.