All the Math You Learned is Wrong.

I often sit alone thinking. It’s not that I don’t like people. It’s that I have big ideas in my head that require an amount of separation from life’s distractions in order to gain an ability to work with them. One of the most perplexing and amazing realizations that I’ve come across is the realization that almost all the math that is taught from algebra, geometry, and beyond is flawed at a basic level when trying to describe the real world. Let’s try to measure the length of the coastline of Maine.

Take a map of Maine, and place a ruler across the coast of Maine, and you might get, for example, 4.0 inches. Easy enough, but did you notice how there were bays, inlets, and points that crisscrossed on either side of the ruler when you measured it? To include these parts of the coastline, we’re going to have to get a smaller ruler or unit of measure so let’s measure every 1/8th of an inch on our map and we’ll find we get a much larger number of 5.125 inches. If we got bigger maps and smaller rulers, we could find that the coastline of Maine is even longer. So if the length of the ruler changes the measurement, what is the actual length?

Now, let’s take an example from geometry: a circle. Let’s say you have a circle and a certain length ruler, you will find the length of the circumference to be a number, say 4.0 inches. Again, you noticed that the ruler didn’t quite cover all the length so you use a smaller ruler and get 4.1 inches. Notice that the increases in length are quite small, and that they get smaller as the ruler gets closer to infinitely small. There just isn’t more detail to add length. At the smallest length, we would find the circumference length is exactly equal to Pi times the diameter.

So, there is an actual length we can measure for the geometrical constructions we learned in school, but not for anything we measure in real life.

To bring these two kinds of measurements together, I’m going to introduce the Koch Curve. The Koch Curve is made by first drawing one line. Then, replace that one line with one made of exactly 4 lines 1/3 the length of the original line as shown in Figure 1. Then, replace each of those lines with the same 4 lines shrunken down repetitively forever. Let’s take a moment to see what the Kock Curve looks like.

A close up of text on a white background

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The Koch Curve isn’t a curve at all. It is purposefully simple to construct, so we will be able to calculate its length. It is self-repeating. If one looks at only one branch, it looks the same as its smaller branches and its larger branches. It also has more detail the smaller you get. So much so that is starts to be fuzzy and appears to have thickness. The detail stretches to infinity.

Which brings us to its length. If the first line’s length is 1.0, then the second line is 4 lengths of 1/3, or 4/3 which is 1.3333. The third iteration is 1.7777. Notice, that the length keeps increasing with each iteration. It keeps increasing like our coastline measurement, and it doesn’t settle on any value like our circumference measurement. So, it appears that this unmeasurable ‘curve’ represents the real world more than geometry.

Because the Koch Curve is so simple, it’s possible to do some explanatory math that leads to a profound conclusion. Let’s express the length by adding n rulers. The first iteration we’ll take as 1.0. The second iteration has 4 ‘lengths’s, but they’re all 1/3 the original length for (4/3) or 1.333. Each iteration will multiply another 4/3 factor so the length of any iteration is equal to (4/3)n which can be infinitely large for an infinite n.

However, what if we took each smaller length and took it to the 4/3 power as our measuring unit? Then the length of any iteration would be (4 / (3\*(4/3))n which reduces to 1n or just plain 1.0. Strange that that would create a measurement that gives us the same length over every iteration of the Koch Curve. We measure length to the first power, area to the second power, and volume to the third. That the measuring with the 4/3 power yields the same result at every scale suggests that the Koch Curve is an object of 4/3 dimension.

Since the coast of Maine behaves much like the Koch Curve, it is not a one-dimensional object, but an object with a dimension higher than one but less than two. That is why we cannot measure the coastline of Maine with a one-dimensional ruler.

As you observe the natural world, you will start to see many lines with fuzzy thickness implying area and thus higher dimensionality. This also holds true for what we perceive as areas that have depth implying higher dimensionality than 2. The real world has varied and shifting dimensionality from tree bark to cloud formations.

The mathematics of algebra and geometry are extremely useful because they present solvable problems, but their assumption of 1, 2, or 3 dimensions does not represent reality. The mathematics that we learned only applies to simplified constructions like lines, squares, and cubes. This is why we can’t solve problems regarding weather prediction, turbulent air flow, earthquake prediction, or even simply measuring the coast of Maine.

When I’m thinking by myself, I’m trying to invent a kind of math that can measure and describe a multi-dimensional universe.