**Mathematical induction**

I was first amazed by its ability to connects finitude with infinity.

When I was learning mathematical induction, my math teacher gave the class a seemingly nice argument to think about.

By using mathematical induction, it proves that for any finite group of Americans, everyone has the same age. Clearly, this is a ludicrously false claim.

The proof was simple, with only 19 lines. The lines were numbered and we were asked to find the line where the proof broke down.

Each of us found very different lines and the argument lasted for the whole class.

We finally found the problem behind the statements and not until then did I really learned the rigor and preciseness of mathematics.

Mathematics is such a language with such high precision that any language in the world cannot reach (except for python and C++). It always defines things that no one may misunderstand. It is way harder for us to understand a Shakespeare play than reading a proof by Gauss.

Mathematics is also a way of thinking. Even if we common people can live without math, we can never ever live without the way of mathematical thinking, or what we call logic.

**Law of Large Numbers & Central Limit Theorem (Probability Theorem)**

According to these two theorems, the sample mean approximate to be normal distribution.

It connects finitude with infinity, sample with population. The seemingly random distribution can form a normal distribution after repeating for enough time.

There are many things in the real world that follows normal distribution. It is amazing that a simple mathematical function can depict the world in such a simple way and find the basic pattern that rules the world, turning the concrete into abstract.

**Brouwer fixed point theorem.**

When I was solving for the general term formula for a linear recursive sequence, I initially used the method of undetermined coefficients and spent a lot of time and efforts in order to get the answer.

When I checked the answer, I discovered something called “fixed point theorem”, which made the answer much shorter than mine.

I became interested in the principle of “fixed point theorem” and searched it online. I found “Brouwer fixed point theorem”, which simply stated that: …, f(x)=x.

A real-life example: when you have a cup of coffee, and you stir it with a teaspoon, without letting the coffee spill out, according to Brouwer fixed point theorem, no matter how you stir the coffee, there will always be a point that remains still at one position. Even if you keep stirring and make the point off the initial position, you can never stop another point to get to its initial position.

I always thought about this theorem with some philosophical meaning behinds it: If you came cross a problem, yet never solve it but just avoid it, it must come back to trouble you some day in the future.