

Numbers

A 'brief' history

You've already learned roughly 150,000 years of maths.



This picture shows what is thought to be the first evidence of humans counting. It is simply notches on a bone.

The next major advance in maths happened over 100,000 years later when the Sumerians started to use tokens to represent the natural numbers;

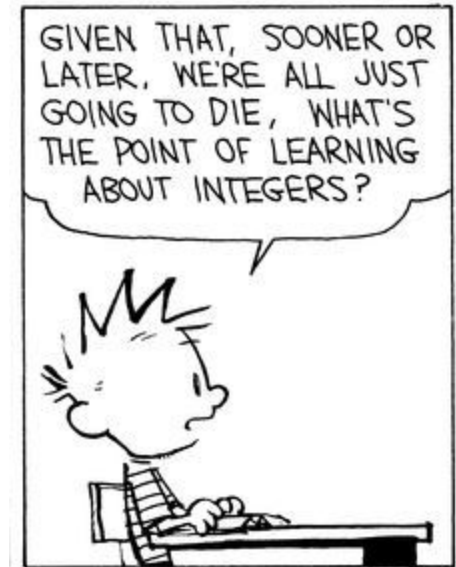
1, 2, 3, 4, ...

We have a natural ability to keep track of small numbers in our heads. Many other mammals can also keep track of numbers up to 3 or 4. With education we, humans, can do much more.

Imagine 100,000 years ago and a young man is given the responsibility of taking care of the herd of sheep.

He lets them out every morning to graze and gets them back in the pen at night (Otherwise they could get killed by a wolf).

You may find it easy to know that 20 sheep go out - 20 sheep come in. But, counting is advanced technology that those people did not have...



How could you solve this?



He would stand at the gate and put a rock in the bucket for every sheep that went out.

He would take a rock out of the bucket when a sheep came back at the end of the day.

If there was still a rock, there was still a sheep outside of the pen.

This boy may have thought the idea of going to school to learn 'counting' was useless and would never be needed in 'real life'.

Zero

It was another 50,000 years before an Indian mathematician would come up with the concept of zero.

I want to emphasize that people were not more dumb in history - you are learning the discoveries of tens of thousands of years of the civilizations smartest people when you count to 10.

Zero was thought of as useless. Numbers were used to count. How can you count zero of something?! What a dumb concept.

Now we have the 'Whole Numbers'.

Bartering Based Business

As long as business was based on bartering there was no real need for currency. You would trade 3 chickens for repairs to your wagon wheel.



If Green wants something from Blue, he needs to hope that he can give something to Red, causing Red to give something to Blue so that Green can get what he wants from Blue.

That's just for 3 people.

As societies develop the complexities of a barter based system quickly become impracticable.

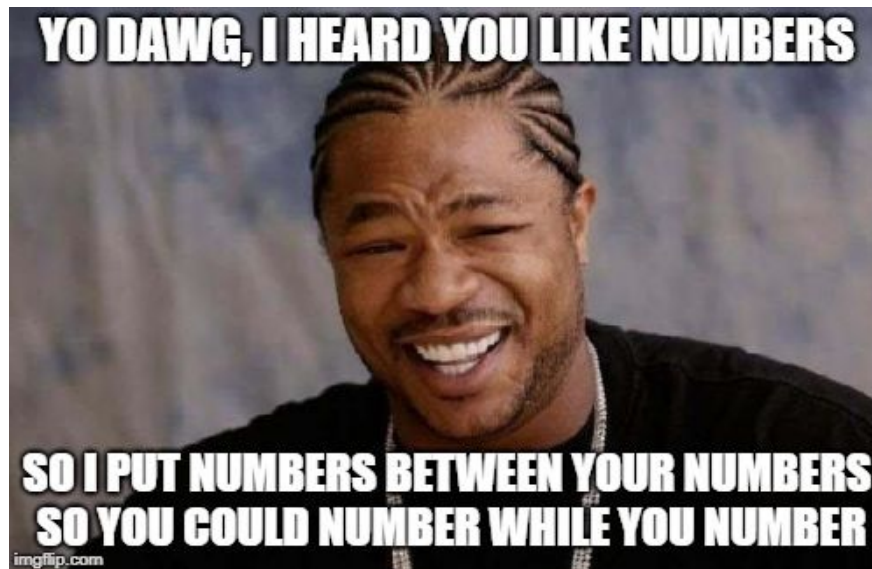
Hence - currency.

Then, like right after → debt.

This means negative numbers.

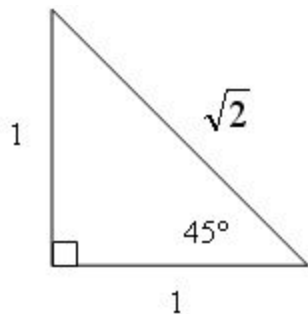
Just the number -1 took humanity up to roughly the year 700.

Numbers Between the Numbers



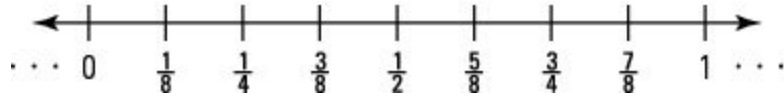
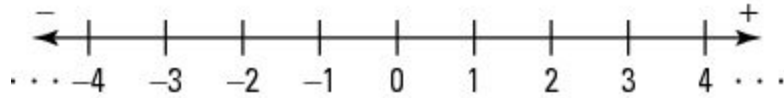
Eventually there was great respect for numbers and a cult/religion formed about the study of numbers. The thought was that if one could understand the true nature of numbers they would understand the nature of the universe and hence - the mind of God.

These people were called the Pythagoreans.



$$a^2 + b^2 = c^2$$

They knew about fractions. They could measure something with a stick and say that it was “half a stick long”. It wasn’t much of a leap to say that it was half of half a stick long. They saw that this half of half process would not necessarily stop and the concept of an infinite number line was born.



One could always put a fraction between two fractions. The number line was smooth and continuous! They solved it. These are the **Rational Numbers**.

$$\sqrt{2}$$

Remember that triangle above...

An easy triangle... side lengths of 1 and 1... That makes the hypotenuse (c) = $\sqrt{2}$. But - This was not on the number line! Heresy! Blasphemy! Kill Him!

People literally died because they could not put $\sqrt{2}$ on a number line. We know now that this is an irrational number. I.e: can not be written as a fraction. Can never write the entire number down. Its decimals go forever and do not repeat.

$$\pi \phi e$$



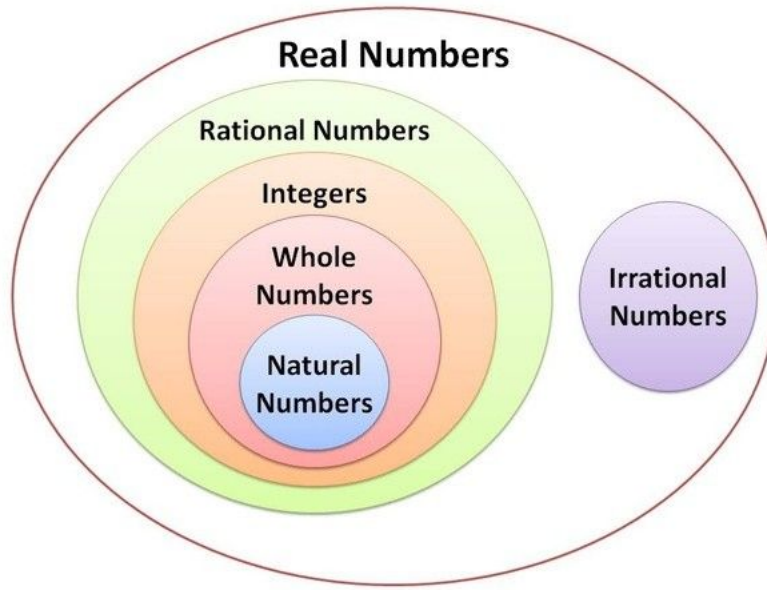
The Babylonians were using written numbers before paper!
Imagine doing your homework by cutting your work into a rock!

This was time consuming - so they used a base 60 counting system.
This still shows up in the way that we keep time.

The Romans insisted on using their number systems and they killed off a lot of the people with better systems when they were trying to take over the world. It was a bad time for maths.

Imagine trying to add, subtract, etc... with Roman Numerals! No wonder maths never went anywhere under their rule.

Eventually reason won out and we use the arabic system today.



That's the story that you need until grade 11.

However, the story goes on...

We still have complex numbers (turn the number line into the number plane!) and hyperreal numbers which make the 2D plane of numbers a 3D cube of numbers!