The theory of numbers

We have a lot of kinds of numbers. I mention some of them for the next purpose. Natural numbers as 1, 2, 3, ... etc. Integers (or whole numbers), ... -3, -2, -1, 0, 1, 2, 3, ... etc. Rational numbers – a ratio of integers .... -1/2, 3/5, 345/727, ... etc. Irrational numbers – Numbers as - $\sqrt{2}$ $\sqrt{7}$ ... etc.

The Real numbers include all numbers above. The imaginary numbers or complex numbers are not mentioned here.

See the next series

∞................0000000000000000000000.0000000000000000000000000...........................∞
∞................0000000000000000000001.0000000000000000000000000...........................∞
∞................0000010000000000000001.0000000000000010000000000...........................∞
∞................0000000000000000000001.5000000000000000000000000...........................∞
∞................0002000000000000000000.0000000000000000000010000...........................∞
∞................0000000000000241456789.4562425897453684512384224...........................∞
∞................0000000000000000000031.4568456124568112358245824...........................∞
∞................0000000000000000000000.3333333333333333333333333...........................∞
∞................5458778954158426478221.1655421000000000000000000 ....∞
∞................4568456221458302158970.4587994561077812054324825.. ....∞

....

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....

....

∞

If we use an integer 1 we silently suppose noughts until infinity. The same is with all integers. If we use a rational number 1/3 (0,3333333....) we know there is always number three at every position after a decimal point until infinity. Rational numbers have predicted or finished positions different from 0 (e.g. 0.3333.. or 0.125000...). The irrational numbers have no predicted or ended numbers at positions after the decimal point. How many numbers at positions we solve, so many numbers we are able to write. Of course we could use billions numbers at positions after the decimal point.

What about a number ...000001,000000.....0001000....00000000000 ? We see, such number is different from a pure number 1 with noughts before and after decimal point. Or the number ...156953567,645578984435489.... . Such number has a random structure before and after the decimal point. How many numbers are there to be?

Anyway. We have integers. All right. The ratio of integers - rational numbers. Of course.

All integers could be derived from the number 1 – see the proof from G. Peano. It´s easy to see them at a number line. After that we are able to construct rational numbers.

Irrationals numbers – how to construct them? We could use the number line either. Better to say two number lines which are perpendicularly to each other. See a next figure

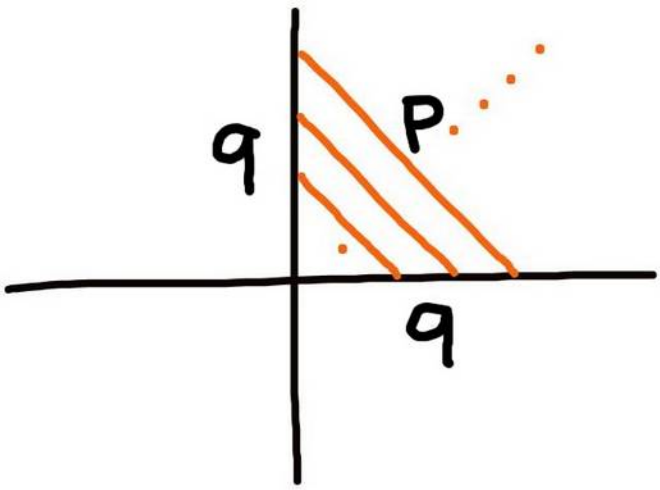

Fig. 1 – two perpendicular lines with diagonal lines

if $\mathbf{q^2 + q^2 = p^2}$ then $\mathbf{2q^2 = p^2}$. It´s clear every diagonal line of a square has an irrational lenght. For all lenghts of such lines. From an infinitesimal small to an infinity big.

The proof - we have suggestion the square root of a number two (or another number) is a rational number, where **p** and **q** are integers

$\sqrt{2}=\frac{p}{q}$ then $(\sqrt{2})^2=\frac{p^2}{q^2}$

we already know $2=\frac{p^2}{q^2}$

then $p^2=2q^2$

we see $\mathbf{p^2}$ must be an odd number, then **p** is also the odd number

we replace the odd number **p** by a substitution of $p=2m$

we obtain $(2m)^2=2q^2$

after that $4m^2=2q^2$

$$2q^2 = 4m^2$$

$$q^2 = \frac{4}{2}m^2$$

$q^2 = 2m^2$ we see **q** is also an odd number in the same way as the number **p**

There is a contradiction with our suggestion, then we know the number $\sqrt{2}$ is not the rational number.

Very important notice: $\sqrt{2}$ is valid only for pure number 1, exactly to write ∞..000000000000000000001.0000000000000000000000000............∞ Such two numbers must be exactly equal to each other.

Every squared number is irrational. Never mind about its value.

But return to the integers. How to make them? One kind is to use the number line again. Firstly we mark at a line some lenght as a unit for number 1. The number 2 we obtain to put together two units. But to put together two identical lenghts where will be the centre? From ancient greek we know it is impossible to divide a finite line to two identical lenghts. Where will be the point of the center of such lenght? Then it is impossible to put them together either?

Our next suggestion – there are no two identical numbers in the universe by using of a pure mathematics. If they are then it is only our imagination. In the real world we know – measured values (press, volume, intensity, temperature, brightness, etc.) - every value is irrational and a plenty of positions are hidden in an uncertainty principle.

to be continued