SONLI SYSTEMAR TUGRISIDA TASAVVURNI KENGAYTIRISH HAQIDA

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ABSTRACT

This article will show how many extensions of the system of rational numbers are the connections between them .

Keywords: sequence of numbers, field, natural numbers, integers, rational numbers, irrational numbers, real numbers, complex numbers, quaternion algebra, Kelly algebra.

Early applications of mathematics begin with the solution of simple linear equations. To do this, it is enough to know the integer and rational numbers.

Below, we are going to focus on giving readers a complete picture of how many extensions the rational number system has and what connections exist between these extensions .

system of all rational numbers Q with a letter, Q any regional number in the system $\frac{p}{q}$ (p -whole san, q esa 0 is different from a natural number) can be expressed as. $\frac{p}{q}$ the apparent rational number can also be expressed in finite or infinite decimal form. If we put 0 at the end of a tick decimal, then that fraction will also become a tick decimal. Therefore, we see that any rational number can be expressed as an infinite decimal. But in these decimal fractions, one or more numbers after the decimal point are based on a certain repeated pattern. For example, $\frac{1}{2} = 0,5000...,$ $\frac{1}{3} = 0,333$ $\frac{30}{7} = 4,28571428571....$ Thus, we found out that any rational number is expressed as an infinite periodic decimal fraction. But even the mathematicians of ancient times knew that there were also decimals that were not infinitely periodic. Such numbers were called irrational numbers. If we denote the system of all irrational numbers by a letter, then the systems of rational and irrational numbers together were called the system of real numbers.

Special bergs are used when writing each irrational number ($\pi,\ e,\ \sqrt{2},\ \sqrt{3}, ...$ and hakazos).

The above definition of the system of real numbers using decimal places is named after Weierstrass. There are other (Dedekind, Kantor, axiomatic) definitions of these number systems.

Denoting the entire system of real numbers by a letter, the R elements Q of sets have the following general properties.

one. $a+b=b+a$

2. $a+(b+c)=(a+b)+c$

3. $a+x=b$ the equation has a solution 4. $a \cdot b = b \cdot a$

5. $a\cdot(b\cdot c)=(a\cdot b)\cdot c$

6. $a\cdot(b+c)=a\cdot b+a\cdot c, (a+b)\cdot c=a\cdot c+b\cdot c$

7. $a\cdot x=b \quad (a\neq 0)$ the equations have a solution.

If during a long meeting as a yukidag there are 7,000 bayarilsa rooms, then a meeting with is called will be organized in this area. Q If R there is an inequality relation between the elements of the set, the following conditions are satisfied:

1) $a\leq a,\ \ a\leq b$ and $b\leq a$ if, then it $a=b$ will be; 2) if $a\leq b$ for any item, C if $a+c\leq b+c$;

3) if $a\leq b$ and $b\leq c$ if, then it $a\leq c$ will be.

If conditions 1) – 4) are satisfied for all elements of the field, then it is called an ordered field. At the same time, these are any 2 fields a, and b for $a\leq b$ yoki elements, $b\leq a$ if one of the relations holds, then this field is called a completely ordered field.

So when R your Q fields become fully sorted fields, R the system Q is an extension of the field. The following properties are common to these fields:

A) linear equations given in the field have a solution;

B) the fields are completely sorted;

) densely spaced along the number axis, that is, any 2 T a and b these are racial (or real) numbers, $a<b$ if the inequality is satisfied, then $a<c<b$ there is a rational (or real) number that satisfies the inequality.

Now let's mention a few distinguishing features of these fields. If $\{a_n\}^\infty$ is a sequence derived from a region and is optionally positive ε so for a number k - if there exists a natural number k any greater than p,q for natural numbers $\left|a_p-a_q\right|<\varepsilon$ when the inequality holds, this sequence is called the fundamental (or cozy) sequence.

If $\{a_n\}^\infty$ given a sequence, optionally positive ε so, for a number k - the license plate and facing step belong a if the number exists, k is greater than all n for natural numbers $\left|a_n-a\right|<\varepsilon$ if the inequality holds, then the $\{a_n\}^2$ sequence is said to be approximating and a the sequence limit is invoked . $\{a_n\}$ In this case, $\lim_{n\to\infty}a_n=a$ the designation is accepted. It can be seen from these definitions that any convergent sequence will be fundamental, but a sequence that is fundamental may not be convergent – For example, the limits $a_n=\left(1+\frac{1}{n}\right)^n$ are defined by equality: $\{a_n\}_1^\infty$ a sequence Q in a Cauchy field satisfies the condition, but is not an approximation.

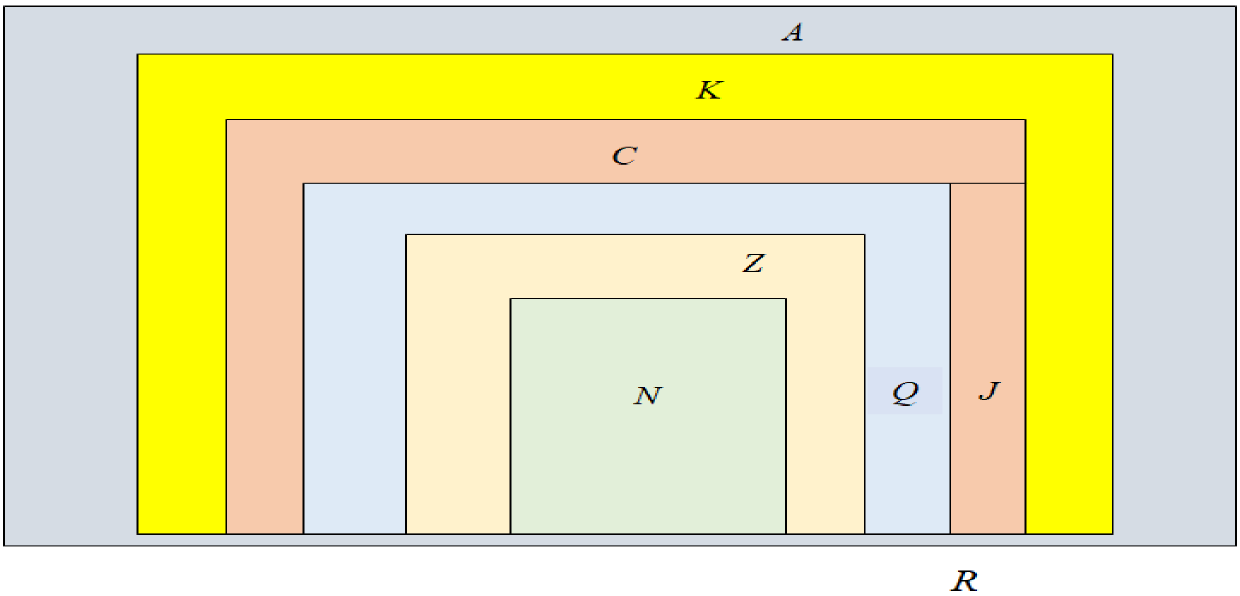
The main difference between the field of real numbers and the field of rational numbers is that any fundamental sequence consisting of real numbers is an approximation, but this property does not hold in the field of rational numbers. Another difference is that in both the number of elements is infinite, but these infinities are different from each other.

When we call the number of elements of an infinite set its "cardinality", the set of real numbers is more powerful. The real number system seems much more perfect, but a simple x^2+1 polynomial with real coefficients in the representation does not have a root in this field.

Polynomials like this can be displayed indefinitely. It is natural to ask whether there is an extension of the field of real numbers containing the roots of such polynomials. $x^2+1=0$ if we denote one root of the equation by a letter, $a+bi$ (here a and b arbitrary real numbers) the whole system of numbers in the set representation is also a field and is an extension of the field of real numbers. This field is called the complex number system. The coefficients C of any, taken from the field, the n level multihead n m the fundamental theorem of algebra about the presence of a root would be appropriate.

But c during the construction of the site R it is impossible to maintain order on the ground. Because i for a complex number $i>0$ or $i<0$ none of the inequalities is relevant. Most importantly C, in the field, any polynomial of positive degree will have a root. This property is called the algebraic closure of the field. Any two- way complex number $e_1=1$ can be generated using visible elements, namely one complex number with two real numbers (e_1 va $e_2=i$ elementlar e_2 through) can be generated.

Naturally, a theoretical question arises as to whether it is possible to construct an extension of the field of complex SNs. Such an extension does not require the commutativity of the operation of multiplication by a field, and not by two, as indicated above 4 that a e_1, e_2, e_3, e_4 uniquely determined field can be constructed using elements. This is called quaternion algebra. If $e_1=1,\ e_2=i,\ e_3=j,\ e_4=k$ when we take the notation in the form, this mutual multiple of the elements $i^2=j^2=k^2=-1,\ \ ij=k,\ \ ji=-k$ satisfies the equations. Since this extension is an extension of the field of complex numbers, it does not satisfy the full order relation and commutativity conditions. It is shown that even the extension of the quaternion algebra can be seen through 8 elements, and not 4, as indicated above, if the associativity of the operation of multiplication by the field is not required. It is called algebraic. Therefore, when constructing extensions of the field of complex numbers, it is necessary to abandon an important tensor. If all correct numbers are ney N, all integers Z, quaternion algebra K, Cayley algebra, A all considered number systems can be represented through the following scheme, if they are denoted by letters: $N\subset Z\subset Q\subset R\subset C\subset K\subset A$.



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