New Number

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1 Introduction

Let's look at the picture showing the relationship between the two lengths. the distance is the same AB=CD, AB is a straight line, CD is empty, we cannot describe this situation with numbers, we need to introduce new numbers .

Figure 1:

2 Empty numbers

$\underline{R}$={...∞-$\underline{2}$∞-$\underline{1}$∞0∞$\underline{1}$∞$\underline{2}$∞...}
∞ - all empty real numbers between two integers .
Position of empty numbers on the number line .

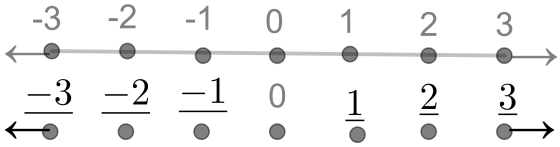

Figure 2:

3 Combined numbers

Theorem-R and $\underline{R}$ form concatenated numbers, made up of $n(n \geq 2)$ members
.
$R_c = \{x_1y_1, y_2x_2, x_3y_3x_4, y_4x_5y_5, ...\}, x_n \in R, y_n \in \underline{R}.$

Examples of where there are combined numbers on the number line .

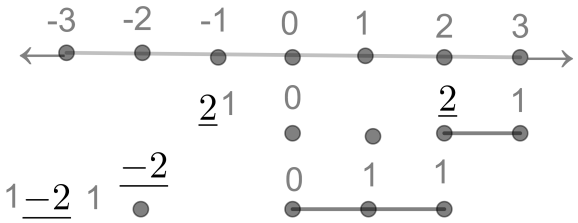

Figure 3:

All real numbers $R_s = \{R, \underline{R}, R_c\}$

Length of the combined number :
...
Length 5 - $1\underline{2}2$, $11\underline{3}$, ...
...
Lenght 10 - $34\underline{3}$, $\underline{8}1\underline{1}$, ...
...
We expand the set of complex numbers $C = (a, b), (a, b \in R_s)$

4 Calculation operations

4.1 Standard operations

4.1.1 Addition

We calculate using the length of the combined number
$2 + \underline{3} = 2\underline{3}$, $\underline{3} + 2 = \underline{3}2$, $2\underline{4}2 + 2\underline{3}2 = 2\underline{44}\underline{3}2$, $2 + \underline{3}2\underline{3} = 2\underline{3}2\underline{3}$

4.1.2 Subtraction

We calculate using the length of the combined number
$2 - \underline{3} = -1$, $\underline{3} - 2 = \underline{1}$, $2\underline{4}2 - 2\underline{3}2 = 1$, $2 - \underline{3}2\underline{3} = -6$

4.1.3 Multiplication

$2 \times \underline{3} = 6$, $\underline{3} \times 2 = \underline{6}$, $2\underline{4}2 \times 2\underline{3}2 =$ not possible , $2 \times \underline{3}2\underline{3} =$ not possible , $\underline{3}2\underline{3} \times 2 = \underline{3}2\underline{6}2\underline{3}$

4.1.4 Division

$2 \div \underline{3} = 0,666...$, $\underline{3} \div 2 = \underline{1,5}$, $2\underline{4}2 \div 2\underline{3}2$ = not possible , $2 \div \underline{3}2\underline{3}$ = not possible , $\underline{3}2\underline{3} \div 2 = \underline{4}$

4.1.5 Exponentiation

$2^{\underline{3}} = 8$, $\underline{3}^2 = \underline{9}$, $2\underline{4}2^{2\underline{3}2}$ = not possible , $2^{\underline{3}2\underline{3}}$ = not possible ,

4.1.6 Roots

$\sqrt[\underline{3}]{2} = \underline{1,25...}$, $\sqrt{\underline{3}}$=1,72... , $\sqrt[2\underline{4}2]{2}\underline{3}2$= not possible , $\sqrt{\underline{3}2\underline{3}}$= not possible .

4.2 Modified standard operations

Each member performs an operation with another member, the results are merged .
Marking the operation:
Addition $+^{/}$
Subtraction $-^{/}$
Multiplication $\times^{/}$
Division $\div^{/}$
Exponentiation $a^{/b}$ or $./$
Roots $\sqrt{/}$
Empty operation v

4.2.1 One layer

$6\underline{5}4+^{/}\ 1\underline{2}3$={$13\underline{2}9$, $\underline{5}1\underline{1}2\underline{3}$, $9\underline{2}7$}

procedure :
6+1=7 , 6+$\underline{2}$=6$\underline{2}$, 6+3=9 , we connect 7 and 6$\underline{2}$ and 9 , 13$\underline{2}$9

$\underline{5}$+1=$\underline{5}$1 , $\underline{5}$+$\underline{2}$=$\underline{7}$, $\underline{5}$+3=$\underline{5}$3 , we connect $\underline{5}$1 and $\underline{7}$ and $\underline{5}$3 , $\underline{5}1\underline{1}2\underline{3}$

4+1=5 , 4+$\underline{2}$=4$\underline{2}$, 4+3=7 , we connect 5 and 4$\underline{2}$ and 7 , 9$\underline{2}$7

The procedure is the same for other operations

4.2.2 Multi layer

$$6\underline{5}4 \begin{matrix} -^{/} \\ \div^{/} \\ \times^{/} \end{matrix} 1\underline{2}3 = \{12, \underline{9.1...}, 24\}$$

Figure 4:

procedure :
$6-^{/}1\underline{2}3$, 6-1=5 , 6-$\underline{2}$=4 , 6-3=3 , we connect 5 and 4 and 3 , 12

$\underline{5} \div^{/} 1\underline{2}3$, $\underline{5} \div 1=\underline{5}$, $\underline{5} \div\underline{2}=\underline{2,5}$, $\underline{5} \div 3=\underline{1,6...}$, we connect $\underline{5}$ and $\underline{2,5}$ and $\underline{1,6...}$, $\underline{9,1...}$

$4 \times^{/} 1\underline{2}3$, 4×1=4 , 4×$\underline{2}$=8 , 4×3=12 , we connect 4 and 8 and 12 , 24

The procedure is the same for other operations

4.2.3 Horizontally one layer

$6\underline{5}4 -^{/}./ +^{/}1\underline{2}3 = \{50, \underline{34}3, 26\}$

procedure :
6-1=5 , $6^{\underline{2}}$=36 , 6+3=9 , we connect 5 and 36 and 9 , 50

$\underline{5} - 1 = \underline{4}$, $\underline{5}^{\underline{2}} = \underline{25}$, $\underline{5} + 3 = \underline{5}3$, we connect $\underline{4}$ and $\underline{25}$ and $\underline{5}3$, $\underline{34}3$

4-1=3 , $4^{\underline{2}}$=16 , 4+3=7 , we connect 3 and 16 and 7 , 26

The procedure is the same for other operations .

4.2.4 Empty operation

$6\underline{5}4 \times^{/} \mathrm{v} -^{/} 1\underline{2}3$= { 15 , $\underline{12}$, 9}
procedure :
6×1=6 , 6 transmits , 6-3=3 , we connect 6 and 6 and 3 , 15

$\underline{5}$×1=$\underline{5}$, $\underline{5}$ transmits , $\underline{5}$-3=$\underline{2}$, we connect $\underline{5}$ and $\underline{5}$ and $\underline{2}$, $\underline{12}$

4×1=4 , 4 transmits , 4-3=1 , we connect 4 and 4 and 1 , 9

The procedure is the same for other operations .

4.2.5 Horizontally multi layer

$$\begin{matrix} & \times & \div & v \\ 6\underline{5}4v & + & -1\underline{2}3 & = \{15, \underline{14}, 20\} \\ v & v & \times & \end{matrix}$$

Figure 5:

procedure :
$6 \times 1 = 6$, $6 \div \underline{2} = 3$, 6 transmits , we connect 6 and 3 and 6 , 15

$\underline{5}$ transmits , $\underline{5}$+$\underline{2}$=$\underline{7}$, $\underline{5}$-3=$\underline{2}$, we connect $\underline{5}$ and $\underline{7}$ and $\underline{2}$, $\underline{14}$

4 transmits , 4 transmits , $4 \times 3 = 12$, we connect 4 and 4 and 12 , 20

The procedure is the same for other operations .

4.3 Logic - modified standard operations

In logic there is true-false, here there is R and $\underline{\mathrm{R}}$
Marking the operation:
Addition $+^n$
Subtraction $-^n$
Multiplication $\times^n$
Division $\div^n$
Exponentiation $a^{n/b}$ or $.n$
Roots $\sqrt{n/}$,
$n \leq 6$

Logic :
n=1 , R and $R \to R$
n=2 , R or $\underline{R} \to R$
n=3 , $\underline{R}$ and $\underline{R} \to R$
n=4 , $\underline{R}$ and $\underline{R} \to \underline{R}$
n=5 , R or $\underline{R} \to \underline{R}$
n=6 , R and $R \to \underline{R}$

The first operation is logic, if it is impossible it gives the result 0, the second operation is not performed .

4.3.1 One layer

$6\underline{5}4 \times^2 1\underline{2}3$={ 12 , 20 , 8 }

procedure :
0 no 6×1 , $6 \times \underline{2} = 12$, 0 no 6×3 , we connect 0 and 12 and 0 , 12

$\underline{5} \times 1 = 5$, no $\underline{5} \times \underline{2}$, $\underline{5} \times 3 = 15$, we connect 5 and 0 and 15 , 20

0 no 4×1 , $4 \times \underline{2} = 8$, 0 no 4×3 , we connect 0 and 8 and 0 , 8

The procedure is the same for other operations .

4.3.2 Multi layer

$$6\underline{5}4 \overset{+^{1}}{\underset{-^{4}}{\div^{5}}} 1\underline{2}3 = \{16, \underline{7.6...}, 0\}$$

Figure 6:

procedure :
6+1=7 , 0 no $6 + \underline{2}$, 6+3=9 , we connect 7 and 0 and 9 , 16

$\underline{5} \div 1 = \underline{5}$, 0 no $\underline{5} \div \underline{2}$, $\underline{5} \div 3 = \underline{1.6...}$, we connect $\underline{5}$ and 0 and $\underline{1.6...}$, $\underline{7.6...}$

0 no 4-1 , 0 no $4 - \underline{2}$, 0 no 4-3 , we connect 0 and 0 and 0 , 0

The procedure is the same for other operations .

4.3.3 Horizontally one layer

$6\underline{5}4 \times^{2} \div^{2} +^{6} 1\underline{2}3 = \{3\underline{9}, 5, 12\underline{7}\}$

procedure :
0 no 6×1 , $6 \div \underline{2} = 3$, $6 + 3 = \underline{9}$, we connect 0 and 3 and $\underline{9}$, $3\underline{9}$

$\underline{5} \times 1 = 5$, 0 no $\underline{5} \div \underline{2}$, 0 no $\underline{5} + 3$, we connect 5 and 0 and 0 , 5

0 no 4×1, $4 \div \underline{3} = 12$, $4 + 3 = \underline{7}$, we connect 0 and 12 and $\underline{7}$, $12\underline{7}$

The procedure is the same for other operations .

4.3.4 Horizontally multi layer

$$\begin{array}{c} \times^3 vv \\ 6\underline{5}4 +^2 v +^3 1\underline{2}1 = \{12, 6\underline{5}, 4\} \\ \div^3 +^1 v \end{array}$$

Figure 7:

procedure :
0 no 6×1 , 6 transmits , 6 transmits , we connect 0 and 6 and 6 ,12

$\underline{5}$+1=6 , $\underline{5}$ transmits , 0 no $\underline{5}$+1 , we connect 6 and $\underline{5}$ and 0 , $6\underline{5}$

0 no $4 \div 1$, 0 no $4 + \underline{2}$, 4 transmits , we connect 0 and 0 and 4 , 4

The procedure is the same for other operations .

4.4 Other operations

There are more operations, you will be introduced soon .

5 Mathematics revision

The mathematics you know is limited, which is a consequence of the large number of axioms . My approach is that there is a mathematical space and two starting axioms . Natural axiom - natural straight line (1), natural empty ($\underline{1}$) . Real axiom - reals straights lines (0.1, 0.01 , 0.001 , ...) , reals emptys ($\underline{0.1}$, $\underline{0.01}$, $\underline{0.001}$, ...) . Since I do mathematical research in my spare time , I discovered many things based on my axioms .