



According to the Binary Number Base System, Are the Square Roots of Two Numbers also Significant in Biochemistry?

Tahir Ölmez

Social Sciences Dept., Selçuk University, Konya, Turkey

Email: bsonmez3@gmail.com, tolmez123@yahoo.com

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Abstract

According to Quantum Perspective Model, this article researches whether there is a link between the square root of **two** numbers and the genetic codes. At first, when the digits of the square root of **two** numbers after the comma are converted from decimal (10) number base system to binary (2) number base system, it corresponds to nucleotide bases. Secondly, the results obtained by this way are expressed as nucleotide bases (**A, T, C, G, and U**): (**A**) Adenine, (**T**) Thymine, (**C**) Cytosine, (**G**) Guanine, (**U**) Uracil. From this point of view, when the first two hundred digits of the square root of **two** numbers after the comma were calculated. Thirdly, the search result is similar to **DANIO RERIO**, and even **Timema**, after the NCBI (National Biotechnology Information Center) searched this sequence [**GGATGTCTATTGAGTGACAA**]. Fourthly, the genetic codes of Zebra fish have been proven to be very similar to human genetic codes. Lastly, Even **Timema** reproduces asexually. From this perspective not only the square root of **two** numbers is irrational number but also **Timema** has abnormal sexual reproduction. In sum, the relationship between the square root of two in mathematical science and the genetic codes also shed lights on Biochemistry.

Subject Areas

Mathematics, Number Theory

Keywords

Quantum Perspective Model, Danio Rerio, Binary Number Base System, The Square Root of Two, Timema

1. Introduction and Calculation of the Square Root of Two Numbers [1] from Decimal Base System (10) to Binary Base System (2) and Binary Base System (2) to Decimal Base System (10)

The relationships between numbers and genetic codes are not only researched with pi numbers but also researched with the golden ratio numbers, too [2]. The name of this relationship research is called **Quantum Perspective Model** by Kevser Köklü [3]. Also, according to this model, this paper attempts to search the relationships between the square root of the number two and the genetic codes (see **Table 1**).

2. Methods and Discussion

The chemical structures of bases include Carbon (C), Nitrogen (N), Oxygen (O), and Hydrogen (H). **Calculation of bases with chemical atoms** (See also **Table 2**) (Ölmez T, 2020) [4].

Table 1. The representation of decimal numbers in the binary base and the representation of binary base numbers to the decimal base.

DECIMAL	1	2	3	4	5	6	7	8	9	10
<i>BINARY</i>	01	10	11	100	101	110	111	1000	1001	1010
DECIMAL	11	12	13	14	15	16	17	18	19	20
<i>BINARY</i>	1011	1100	1101	1110	1111	10000	10001	10010	10011	10100
DECIMAL	21	22	23	24	25	26	27	28	29	30
<i>BINARY</i>	10101	10110	10111	11000	11001	11010	11011	11100	11101	11110
DECIMAL	31	32	33	34	35	36	37	38	39	40
<i>BINARY</i>	11111	100000	100001	100010	100011	100100	100101	100110	100111	101000
DECIMAL	41	42	43	44	45	46	47	48	49	50
<i>BINARY</i>	101001	101010	101011	101100	101101	101110	101111	110000	110001	110010
DECIMAL	51	52	53	54	55	56	57	58	59	60
<i>BINARY</i>	110011	110100	110101	110110	110111	111000	111001	111010	111011	111100
DECIMAL	61	62	63	64	65	66	67	68	69	70
<i>BINARY</i>	111101	111110	111111	1000000	1000001	1000010	100011	1000100	1000101	1000110
DECIMAL	71	72	73	74	75	76	77	78	79	80
<i>BINARY</i>	1000111	1001000	1001001	1001010	1001011	1001100	1001101	1001110	1001111	1010001
DECIMAL	81	82	83	84	85	86	87	88	89	90
<i>BINARY</i>	1010001	1010010	1010011	1010100	1010101	1010110	1010111	1011000	1011001	1011010
DECIMAL	91	92	93	94	95	96	97	98	99	100
<i>BINARY</i>	1011011	1011100	1011101	1011110	1011111	1100000	1100001	1100010	1100011	1100100

Table 2. Representation of nucleotide bases (A, T, C, G and U) in chemical atoms.

<i>ATOMS/NUCLEOTIDE BASES</i>	<i>C = 6</i>	<i>H = 1</i>	<i>O = 8</i>	<i>N = 7</i>	<i>SUM</i>
ADENINE: C ₅ H ₅ N ₅	5	5	-	5	70
THYMINE: C ₅ H ₆ N ₂ O ₂	5	6	2	2	66
CYTOSINE: C ₄ H ₅ N ₃ O ₁	4	5	1	3	64
GUANINE: C ₅ H ₅ N ₅ O ₁	5	5	1	5	78
URACIL: C ₄ H ₄ N ₂ O ₂	4	4	2	2	58

The atomic numbers of them: Carbon (**C**): 6, Nitrogen (**N**): 7, Oxygen (**O**): 8, Hydrogen (**H**): 1 (Wieser E M *et al.*, 2013) [5]. The chemical structures of bases (**A**, **T**, **C**, **G**, and **U**) are shown below (Ölmez T, 2020) [4].

(**A**) Adenine: $C_5H_5N_5$: **70**;

(**T**) Thymine: $C_5H_6N_2O_2$: **66**,

(**C**) Cytosine: $C_4H_5N_3O_1$: **64**,

(**G**) Guanine: $C_5H_5N_5O_1$: **78**, and

(**U**) Uracil: $C_4H_4N_2O_2$: **58**

(Lodish H *et al.*, 2018) [6].

Also in this research, genetic codes were used as a new formula (Nirenberg *et al.*, 1965) [7] just like as (**A**, **T**, **C**, **G**, and **U**). (**A**) Adenine, (**T**) Thymine, (**C**) Cytosine, (**G**) Guanine, (**U**) Uracil. Before this work, the fourteen groups of Pi number can be shown as:

Continuous **UTA**'s by Kevser Köklü [3]. Also, another favorite sample of this research is done with velocity of light numbers by Kevser Köklü again [8]. Lastly, in another article with identical cis regulatory elements examined the links between the Golden Ratio numbers [2]. After all these studies, the square root of the two numbers and the genetic codes are now being investigated in relation to the Quantum Perspective Model.

3. Calculation of the Square Root of Two Numbers and Genetic Codes

The first two hundred digits of the square root of two after the comma are here:

1.4142135623730950488016887242096980785696718753769480731766797
3799073247846210703885038753432764157273501384623091229702492483
6055850737212644121497099935831413222665927505592755799950501152
7820605714701095599716059702745345968620147285174186408891986095
5232923048430871432145083976260362799525140.

At first, the first two digits after the comma were taken each time. For example, **41**, **42**, **13**, **56**, **23**, **73**, **09**, **50**, **48** ... and so on. Then these numbers are found in the **binary number system** in **Table 1**. (For instance, “**41**”, **101001** and so on). Secondly, convert these **binary** numbers to **decimal** number base (For instance, “**41**” **101001**; $10 = 2$, $100 = 4$ and $1 = 1$). Thirdly, all **decimal** numbers are subjected to the addition process, respectively. ($2 + 4 + 1 = 7$). All of the first result of the addition is “**75**”. Just like as in Guanine (**G**): **78** (See also **Table 2**).

41	42	13	56	23	73	09	50	48
101001	101010	1101	111000	10111	1001001	1001	110010	110000
10 100 1	10 10 10	1 101	11 1000	10 111	100 100 1	10 01	1 100 10	1 10000
$2 + 4 + 1$	$2 + 2 + 2$	$+1 + 5$	$+3 + 8$	$+2 + 7$	$+4 + 4 + 1$	$+2 + 1$	$+1 + 4 + 2$	$+1 + 16 = 75$ (G) Guanine: 78
80	16	88	72	42	09	69		
1010001	10000	1011000	1001000	101010	1001	1000101		
10 1000 1	10000	101 1000	100 1000	10 10 10	10 01	1000 101		
$2 + 8 + 1$	$+16$	$5 + 8$	$4 + 8$	$+2 + 2 + 2$	$+9$	$+8 + 5 = 80$ (G) Guanine: 78		

Continued

80	78	56	96	71				
1010001	1001110	111000	1100000	1000111				
10 1000 1	100 11 10	11 1000	1 100000	1000 111				
2 + 8 + 1	+4 + 3 + 2	+3 + 8	+1 + 32	+8 = 72 (A) Adenine: 70				
71 (MORE) 87	53	76	94	80				
1000111	1010111	110101	1001100	1011110	1010001			
111	10 10 111	110 101	100 1100	101 11 10	10 1000 1			
7 +	2 + 2 + 7	+6 + 5	+4 + 12	+5 + 3 + 2	+2 + 8 + 1 = 66 (T) Thymine: 66			
73	17	66	79	73	79	90		
1001001	10001	1000010	1001111	1001001	1001111	1011010		
100 100 1	1000 1	10000 10	100 11 11	100 100 1	100 11 11	101 10		
4 + 4 + 1	+8 + 1	+16 + 2	+6 + 3 + 3	+4 + 4 + 1	6 + 3 + 3	+5 + 2 = 76 (G) Guanine: 78		
90 (MORE) 73	24	78	46	21	07	03	88	
1011010	1001001	11000	1001110	101110	10101	111	11	1011000
10	100 100 1	1 1000	100 11 10	10 11 10	10 101	111	11	101 1000
2	+4 + 4 + 1	+1 + 8	+4 + 3 + 2	2 + 3 + 2	2 + 5	+7	+3 +	5 + 8 = 66 (T) Thymine: 66
50	38	75	34	32				
110010	100110	1001011	100010	100000				
1 100 10	10 01 10	100 10 11	1000 10	100000				
1 + 4 + 2	+2 + 1 + 2	+4 + 2 + 3	+8 + 2	+32 = 63 (C) Cytosine: 64				
76	41	57	27	35	01	38	46	
1001100	101001	111001	11011	100011	01	100110	101110	
100 1100	10 100 1	11 100 1	1 10 11	1000 11	01	100 110	10 11 10	
4 + 12	+2 + 4 + 1	+3 + 4 + 1	+1 + 2 + 3	+8 + 3	+1 +	4 + 6	+2 + 3 + 2 = 66 (T) Thymine: 66	
23	09	12	29	70	24	92	48	
10111	1001	1100	11101	1000110	11000	1011100	110000	
10 111	10 01	1 100	11 10 1	1000 110	1 1000	101 1 100	1 10000	
2 + 7	+2 + 1	+1 + 4	+3 + 2 + 1	+8 + 6	+1 + 8	+5 + 1 + 4	+1 + 16 = 73 (A) Adenine: 70	
36	05	58	50	73	72	12	64*	
100100	101	111010	110010	1001001	1001000	1100	1000000	
100 100	10 1	11 10 10	1 100 10	100 100 1	100 1000	1 100	1000000	
4 + 4 +	+2 + 1	+3 + 2 + 2	+1 + 4 + 2	+4 + 4 + 1	4 + 8	+1 + 4	+16 (<u>"00" EMPTY</u>): 67 (T) Thymine: 66	
41	21	49	70	99	93	58		
101001	10101	110001	1000110	1100011	1011101	111010		
10 100 1	10 101	1 1000 1	1000 110	1 1000 11	10 11 101	11 10 10		
2 + 4 + 1	+2 + 5	+1 + 8 + 1	+8 + 6	+1 + 8 + 2	+2 + 3 + 5	+3 + 2 + 2 = 66 (T) Thymine: 66		
31	41	32*	22	66	59	27	50	
11111	101001	100000	10110	1000010	111011	11011	110010	
11 11 1	10 100 1	1000 00	10 110	10000 10	11 10 11	1 10 11	1 100 10 (<u>"00" EMPTY</u>)	
3 + 3 + 1	+2 + 4 + 1	+16	+2 + 6	+16 + 2	3 + 2 + 3	+1 + 2 + 3	+1 + 4 + 2 = 77 (G) Guanine: 78	
55	92	75	57	99	95	05	01	15
110111	1011100	1001011	111001	1100011	1011111	101	01	1111
110 111	101 1 100	100 10 11	11 100 1	1 1000 11	10 11 11 1	10 1	01	11 11
6 + 7	+5 + 1 + 4	+4 + 2 + 3	+3 + 4 + 1	+1 + 8 + 2	+2 + 3 + 3 + 12 + 1	+1 +		3 + 3 = 70 (A) Adenine: 70

Continued

27	82	06	05	71	47	01	09	55	99
11011	1010010	110	101	1000111	101111	01	1001	110111	1100011
110 11	10 100 10	1 10	10 1	1000 111	10 11 11	01	10 01	110 111	1 1000
6 + 3	2 + 4 + 2	+1 + 2	+2 + 1	+8 + 7	2 + 3 + 3	+1	+9	+6 + 7	1 + 8 = 78 (G) Guanine: 78
99 (MORE) 71	60	59	70	27	45				
1100011	1000111	111100	111011	1000110	11011	101101			
11	1000 111	11 1 100	111011	1000 110	1 10 11	10 11 01			
8	8 + 7	+3 + 1 + 4	+3 + 2 + 3	8 + 7	1 + 2 + 3	+2 + 3 + 1 = 66 (T) Thymine: 66			
34	59	68	62	01	47	28	51	74	18
100010	111011	1000100	111110	01	101111	11100	110011	1001010	10010
1000 10	11 10 11	1000 100	11 11 10	01	10 11 11	11 100	1 100 11	100 10 10	100 10
8 + 2	3 + 2 + 3	8 + 4	+3 + 3 + 2	+1	+2 + 3 + 3	+3 + 4	+1 + 4 + 3	+4 + 2 + 2	+4 + 2 = 76 (G) Guanine: 78
64*	08	89	19	86	09	55			
10000 00	1000	1011001	10011	1010110	1001	110111 (“00”EMPTY)			
10000 00	1000	10 1 10 01	10011	10 10 110	1001	110 111			
16	+8 +	2 + 1 + 2 + 14 + 3		+2 + 2 + 6	+9	+6 + 7 = 69 (A) Adenine: 70			
23	29	23	04	84	30	87	14		
10111	11101	10111	100	1010100	11110	1010111	1110		
10 111	11 10 1	10 111	100	10 10 100	11 110	10 10 111	11 10		
2 + 7	+3 + 2 + 1	+2 + 7	+4	+2 + 2 + 4	+3 + 6	2 + 2 + 7	+3 + 2 = 61 (C) Cytosine: 64		
32	14	50	83	97					
100000	1110	110010	1010011	1100001					
100000	11 10	1 100 10	10 100 11	1 10000 1					
32	+3 + 2	+1 + 4 + 2	+2 + 4 + 3	+1 + 16 + 1 = 71 (A) Adenine: 70					
62	60	36	27	99	52	51	40		
111110	111100	100100	11011	1100011	110100	110011	101000		
11 11 10	111 100	100 100	1 10 11	1 1000 11	110 100	1 100 11	10 1000		
3 + 3 + 2	+7 + 4	+4 + 4	+1 + 2 + 3	+1 + 8 + 2	+6 + 4	+1 + 4 + 3	+2 + 8 = 72 (A) Adenine: 70		

This sequence can be shown as [GGATGTCTATTGAGTGACAA]. Let me try to explain this sequence with the “Quantum Perspective Model.” For example, The **second** groups of the square root of two after comma equal to Guanine (G): 80 with two more of Hydrogen bonds (H: 1). (Remember, See **Table 2**; Guanine (G): 78) This result could be the meaning of the square root of two sequence in groups [GGATGTCTATTGAGTGACAA]. The **tenth** groups of the square root of two after the comma is regarded as Thymine (T) with the one more of Hydrogen bond (H: 1). (Because the **deviations** in the calculation of the square root of two numbers can be derived from the Adenine (A) - Thymine (T) Hydrogen bonds because of Adenine (A) pairs with Thymine (T) by *two* hydrogen bonds. Cytosine (C) - Guanine (G) pairs with by *three* hydrogen bonds [3]. The reason for the lack of hydrogen bonds: **Hydrogen bonding** is a very versatile attraction. (Ölmez T, 2020) [3] Hydrogen bonds are relatively *weak and easily broken* by increasing hardness (Farrell, 2010) [9]. During the calculation, the “EMPTY” numbers “00” are disregarded. According to the number-based system, the number “00” has no value, neither in the decimal nor in

the binary-based system. According to binary encoding base system, on the case of current not passing, this means **0 (zero)**. That's why, it can be the reason of disregardance of “EMPTY” “00” numbers. Please, ignore the “EMPTY” numbers “00” for calculation especially in tenth, twelfth and seventh groups.

4. Results

After searching the square root of two numbers result in [GGATGTCTATTGAGTGACAA] The National Center for Biotechnology Information (NCBI) databases, some conceptual relationships can be found with **bony fish** [10]. Types of **bony fishes** are based on DANIO RERIO (**Zebra fish**). (See **Figure 1**). Types of other living creatures are potato, dog, blunt-snouted clingfish, milk fish, Georgia icefish, gold fish, pinocone soldier fish, Indian glassy fish, house mouse, golden spiny mouse, Southern grasshopper mouse, South leopard coralgroupher, river trout, chimpanzee, **Timema cristinae** (insect), **Timema monikensis**, **Timema poppensis**, Chinook salmon, large flying fox, **Danio khathit**, **Danio aesculapii**, Zebra finch, small spotted catshark, pig and (See **Figure 2**). **Danio khathit** and **Danio aesculapii** have a similar genetic

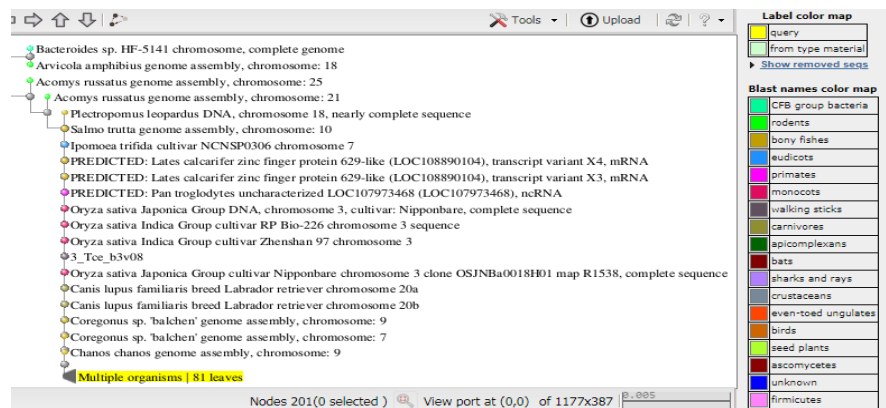


Figure 1. The NCBI (National Biotechnology Information Center) result blast tree view for “GGATGTCTATTGAGTGACAA” nucleotide sequence [13].

PREDICTED: Lates calcarifer zinc finger protein 629-like (LOC108890104), transcript variant X4, mRNA	barramundi.e...	36.2	36.2	90%	9.1	100.00%	2167	XM_018686917.1
PREDICTED: Lates calcarifer zinc finger protein 629-like (LOC108890104), transcript variant X3, mRNA	barramundi.e...	36.2	36.2	90%	9.1	100.00%	3742	XM_018686909.1
PREDICTED: Pan troglodytes uncharacterized LOC107973468 (LOC107973468), ncRNA	chimpanzee	36.2	36.2	90%	9.1	100.00%	2665	XR_001715778.1
Oryza sativa Japonica Group DNA, chromosome 3, cultivar Nipponbare, complete sequence	Japanese rice	36.2	36.2	90%	9.1	100.00%	36413819	AP014959.1
Oryza sativa Indica Group cultivar RP Bio-226 chromosome 3 sequence	long-grained...	36.2	36.2	90%	9.1	100.00%	39604267	CP012611.1
Oryza sativa Indica Group cultivar Zhenshan 97 chromosome 3	long-grained...	36.2	36.2	90%	9.1	100.00%	39636162	CP056054.1
3_Tce_b3v08	Timema crist...	36.2	36.2	90%	9.1	100.00%	821	OC379152.1
Acomys russatus genome assembly, chromosome 21	golden spiny...	36.2	66.4	95%	9.1	100.00%	61132863	LR877232.1
Oryza sativa Japonica Group cultivar Nipponbare chromosome 3 clone OSJNba0018H01 map R1538...	Japanese rice	36.2	36.2	90%	9.1	100.00%	142712	AC087181.9
Canis lupus familiaris breed Labrador retriever chromosome 20a	dog	34.2	34.2	85%	36	100.00%	58324418	CP050571.1
Canis lupus familiaris breed Labrador retriever chromosome 20b	dog	34.2	34.2	85%	36	100.00%	58321546	CP050631.1
Coregonus sp. 'balchen' genome assembly, chromosome 9	Coregonus s...	34.2	34.2	85%	36	100.00%	65193448	LR778261.1
Coregonus sp. 'balchen' genome assembly, chromosome 7	Coregonus s...	34.2	34.2	85%	36	100.00%	65391737	LR778259.1
Chanos chanos genome assembly, chromosome 9	milkfish	34.2	34.2	85%	36	100.00%	43790413	LR697114.1
Chanos chanos genome assembly, chromosome 6	milkfish	34.2	34.2	85%	36	100.00%	50300218	LR697111.1
PREDICTED: Salmo trutta 5-hydroxytryptamine receptor 3A-like (LOC115148628), mRNA	river trout	34.2	34.2	85%	36	100.00%	3793	XM_029690828.1
Myriophis murdani genome assembly, chromosome 6	pinocone sol...	34.2	34.2	85%	36	100.00%	35357120	LR597555.1
Salmo trutta genome assembly, chromosome 15	river trout	34.2	34.2	85%	36	100.00%	66900148	LR684415.1
PREDICTED: Gouania willdenowii catatin like phospholipase domain containing 4 (pnla4), transcript v...	blunt-snouted...	34.2	34.2	85%	36	100.00%	2622	XM_028465623.1
PREDICTED: Gouania willdenowii catatin like phospholipase domain containing 4 (pnla4), transcript v...	blunt-snouted...	34.2	34.2	85%	36	100.00%	2459	XM_028465616.1
Anabas testudineus genome assembly, chromosome 15	climbing perch	34.2	34.2	85%	36	100.00%	21921250	LR132040.1
Gouania willdenowii genome assembly, chromosome 2	blunt-snouted...	34.2	34.2	85%	36	100.00%	13848833	LR132002.1

Figure 2. The NCBI (National Biotechnology Information Center) result for nucleotide sequence “GGATGTCTATTGAGTGACAA” [13].

codes of Danio RERIO [11]. Another interesting result of NCBI is **Timema**. The longest known asexual period for **Timema**, including two species that have not engaged in sexual reproduction for a million years. Their eggs are about **two** mm long. One of the species of **Timema** is striped, which also shows camouflage function [12]. **Asexuality** in animals is rare, and the **Timema**-insect lineage that evolved without sex has been proven to have survived for centuries and even **Timema** reproduces asexually [13].

5. Conclusions

The most widely used number digit system today is decimal. But in this work, the square root of two **numbers** has been converted from decimal base system to binary number base system. Both the common feature of binary numbers (0 or 1) and the square root of two contain *two* numbers [14]. When the digits of the *Euler number* after the comma are converted from the decimal (10) number base system to the *binary (2) number base system*, they correspond to the number “55” in the *Fibonacci series* (0, 1, 1, 2, 3, 5, 8, 13, 21, 34, **55**...) [4]. Likewise, in this research, *binary (2) number base system* is used, too.

Firstly, the results of this research can be summarized as obtaining the number of root two after the comma through the chemical structure of the genetic codes. Secondly, the root two digits after the comma can be thought of as an indicator of genetic codes. One of the results of both Biochemistry and Mathematics common features is the NCBI blast results. Because these include both **bony fish** and in particular the **DANIO RERIO. Zebra fish** are an excellent favorite example used in many studies related to Biochemistry and genome [3]. One of the common NCBI results of *pi* numbers and *Euler* numbers with the *square of the speed of light* is Zebra fish [3] [8]. Let alone this result, NCBI result for CAAT Box and TATA Box also consist of **bony fishes** (Remember, Zebra fish are kind of bony fish, too) [15]. Finally, the calculation results of the square of two numbers with genetic codes [especially (**A**) Adenine, (**T**) Thymine, (**C**) Cytosine, (**G**) Guanine and (**U**) Uracil] are related to both Biochemistry and Mathematics. In short, the digits of the square root of two after the comma can be attributed not only to numbers in *Mathematics*, but also to genetic codes in *Biochemistry*. In summary, this similarity may be the beginning of the mutual relations of the sciences on the basis of the **Quantum Perspective Model**. That is, genetic codes can be taken as a small unit of analysis from the same perspective as mathematical numbers.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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