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Different Numerous Systems Correspond to Different Universes: Revealing the Secret behind Nikola Tesla Code of 3, 6, 9

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Abstract: ***The statement of Nikola Tesla* that if you knew the magnificence of three, six and nine, you would have a key to the universe implies that there must be something special about these three numbers. In this paper it is demonstrated that the underlying reason for this specialty is the employment of decimal system (which is a base-10 system in which the ten numbers including 0 , 1 , 2, 3, 4, 5, 6, 7, 8, 9 serve as 'elementary particles' to establish a numerous world) to describe the universe. If a different numerous system is employed, these three numbers of 3, 6, 9 may lose their magnificence or even may not exist. *The investigation of the different patterns of the digital roots of the elements in the sequence { 1, 2, 4, 8, 16, 32, 64, 128…} in different numerous systems is conducted, and it is shown that no repeated pattern exists in base-9 numerous system, and the repeated patterns in base-8, base-11, base-12, and base-13 numerous systems are different from the repeated pattern in decimal system. And it is proved that in a base-N numerous system, the digital root of the sum of the interior angles of a polygon is equal to N-1.***

Keywords: Nikola Tesla; base; numerous system; universe

1. Introduction

There is a fundamental question that numbers are inventions or discoveries. When small children first go to school to learn mathematics, they are educated that 1+1 = 2, 2+3 = 5, 1+9 = 10, etc. These are regarded as unshakable truths. In the four fundamental interactions between numbers, which include addition, subtraction, multiplication, and division, division is the most difficult. Prime numbers [1] are very stubborn and they can only be divided by one and themselves, and they have always motivated mathematicians to search the law behind them. Nikola Tesla was born in July 1856 in Austrian Empire, and he had numerous inventions in the fields of mechanical and electrical engineering. It is widely recognized that his most influential contribution is the invention of modern alternating current supply system. Tesla claimed the importance of numbers, especially the three numbers: 3, 6, 9. This is manifested by investigating the pattern of the digital roots of the numbers in the sequence {1, 2, 4, 8, 16, 32, 64, 128,…} in which the starting element is 1, and for the rest of the elements, each of them is twice of the previous one. The digital root is also named repeated digital sum. It is obtained by iteratively summing the digits. For example the digital root of the number 64 is 1 (6+4 =10, and 1+0=1), and the digital root of the number 128 is 2 (1+2+8=11, and 1+1=2). For the sequence {1, 2, 4, 8, 16, 32, 64, 128,…}, a repeated pattern of 1, 2, 4, 8 ,7, 5 emerges if we calculate the digital root of each number in the sequence. The three numbers 3, 6, 9 are not in this pattern; they are free from this pattern, and someone interprets the three numbers are associated with the concept of free energy [2].

In this paper, it is shown that the underlying mechanism to make this (the disappearance of 3, 6, 9 in the digital roots of the numbers in the sequence {1, 2, 4, 8, 16, 32, 64, 128…}) happen is that we use decimal system. For the sequence of the digital roots of the elements of the sequence {1, 2, 4, 8, 16, 32, 64, 128…}, there would be no repeated pattern or different repeated patterns if we used different numerous systems. Moreover, it is proved that the digital root of the sum of the interior angles of a polygon in a base-N numerous system is N-1; it is independent of the side number of the polygon.

2. Interpretation of the Meaning of Digital Root

In decimal system, there are ten bases including 0 , 1, 2, 3, 4, 5, 6, 7, 8, 9. As to the sequence { $(1)_{10}$, $(2)_{10}$, $(4)_{10}$, $(8)_{10}$, $(16)_{10}$, $(32)_{10}$, $(64)_{10}$, $(128)_{10}$, $(256)_{10}$, $(512)_{10}$, $(1024)_{10}$, $(2048)_{10}$ …}, where the meaning of the denotation is such that the number $(1)_{10}$ means the number 1 in decimal system, $(2)_{10}$ means the number 2 in decimal system, and so on, the repeated pattern of the sequence of the digital roots of these elements is $(1)_{10}$, $(2)_{10}$, $(4)_{10}$, $(8)_{10}$, $(7)_{10}$, $(5)_{10}$, $(1)_{10}$, $(2)_{10}$, $(4)_{10}$, $(8)_{10}$, $(7)_{10}$, $(5)_{10}$…. This can be explained by the concept of congruence in number theory. Two integers of a and b are called congruent modulo n, where n is a positive integer, if $a-b$ is divisible by n, and this is denoted as $a \equiv b \pmod{n}$. Here n is the maximum base in base-$(n+1)$ numerous world in which the bases are 0, 1, 2, 3… n. A decimal system has 10 bases of 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. And in this numerous system there are congruent relations below:

$$
\begin{aligned}
&1 \equiv 1 \pmod 9 && 2 \equiv 2 \pmod 9 \\
&4 \equiv 4 \pmod 9 && 8 \equiv 8 \pmod 9 \\
&16 \equiv 7 \pmod 9 && 32 \equiv 5 \pmod 9 \quad (1) \\
&2^{6n} \equiv 1 \pmod 9 && 2^{6n+1} \equiv 2 \pmod 9 \\
&2^{6n+2} \equiv 4 \pmod 9 && 2^{6n+3} \equiv 8 \pmod 9 \\
&2^{6n+4} \equiv 7 \pmod 9 && 2^{6n+5} \equiv 5 \pmod 9 \\
&\text{where } n \geq 1
\end{aligned}
$$

This can also be explained by periodical boundary condition (PBC) [3] which is often used in molecule dynamics simulation. PBC is used to describe a large and infinite system by using a small unit called primary unit, and the other units are called images. If an entity goes out of one side of the unit cell, it reappears on the opposite side. Generally, PBC says that if you go out of the universe, you suddenly appear in the opposite.

In figure 1, it can be seen that the person is in the position of 9 in the primary cell, and the two persons in the left and right images are in the same position of 9 in their image units. If the person in the primary unit moves one step toward the right side, the person in the left image moves in the primary unit and settles down in the position of 1. It appears to the observer only observing the primary unit that once the person goes out of the primary unit and the person suddenly appears in the opposite of the unit.

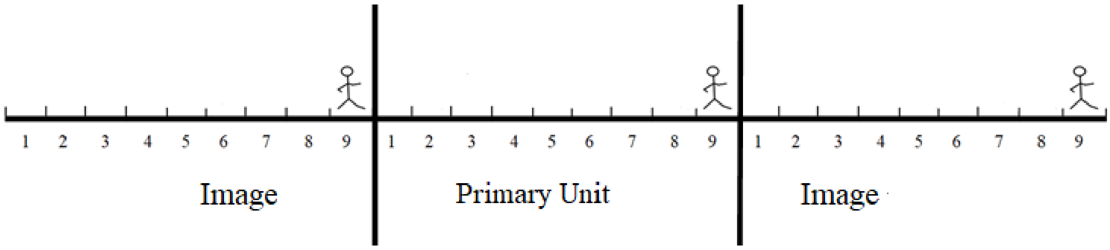

Figure 1: An interval of length of 9 with periodical boundary conditions applied to the left and right sides

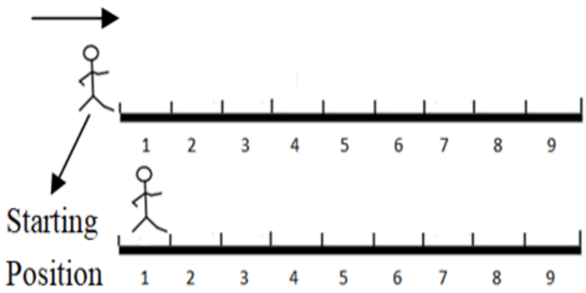

Figure 2: A person moves 10 steps and finally settles down in the position of 1 in an interval (with periodical boundary condition) with length of 9

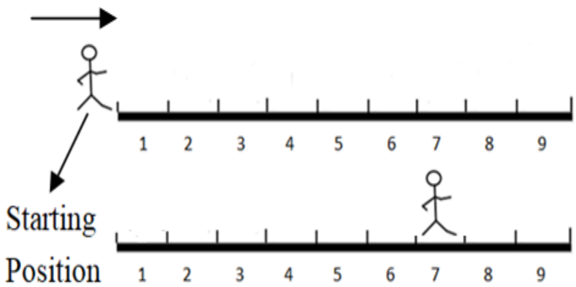

Figure 3: A person moves 16 steps and finally settles down in the position of 7 in an interval (with periodical boundary condition) with length of 9

In decimal system, the digital root of a positive integer a can be explained as the final position the person settles down in the periodical interval (with length of 9) after moving a steps from the starting position just next to the interval, as shown in Figure 2 and Figure 3.

In base-N numerous system, the digital root of a positive integer a can be explained as the final position the person settles down in the periodical interval (with length of N-1) after moving a steps from the starting position just next to the interval. In figure 4, it shows a physical process that in a periodical interval with length of N-1, a person moves N steps from the starting position just next to the interval and finally settles down in the position 1.

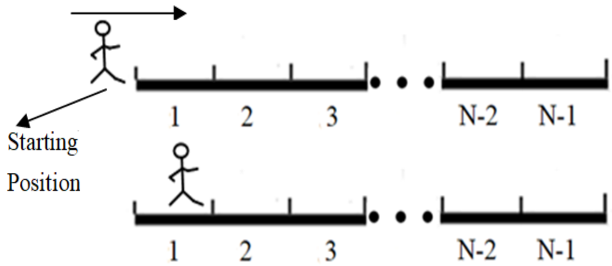

Figure 4: A person moves N steps and finally settles down in the position of 1 in an interval (with periodical boundary condition) with length of N-1

In general, the digital root of a positive integer a in base-N numerous system is equal to N-1 if a is divisible by N-1, and it is equal to a positive number b (which is less than N-1) such that $a \equiv b \pmod{\text{N-1}}$ if a is not divisible by N-1.

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3. Different patterns of the sequence of digital roots of the elements of a sequence {1, 2, 4, 8, 16, 32, 64, 128, 256…} in different numerous systems

Different numerous systems are established by different bases and a number appears differently in different numerous systems, as shown in Table 1 to 6

Table 1: Bases in base-8 numerous system

0	1	2	3	4	5	6	7

Table 2: Bases in base-9 numerous system

0	1	2	3	4	5	6	7	8

Table 3: Bases in decimal system

0	1	2	3	4	5	6	7	8	9

Table 4: Bases in base-11 numerous system

0	1	2	3	4	5	6	7	8	9	A

Table 5: Bases in base-12 numerous system

0	1	2	3	4	5	6	7	8	9	A	B

Table 6: Bases in base-13 numerous system

0	1	2	3	4	5	6	7	8	9	A	B	C

For the sequence {1, 2, 4, 8, 16, 32, 64, 128, 256…}, it is written differently with different bases in different numerous systems, as shown in Table 7.

Table 7: Numbers Written Differently in Different Numerous Systems

Decimal system	Base-9 system	Base-8 system	Base-13 system	Base-12 system	Base-11 system
$(1)_{10}$	$(1)_9$	$(1)_8$	$(1)_{13}$	$(1)_{12}$	$(1)_{11}$
$(2)_{10}$	$(2)_9$	$(2)_8$	$(2)_{13}$	$(2)_{12}$	$(2)_{11}$
$(4)_{10}$	$(4)_9$	$(4)_8$	$(4)_{13}$	$(4)_{12}$	$(4)_{11}$
$(8)_{10}$	$(8)_9$	$(10)_8$	$(8)_{13}$	$(8)_{12}$	$(8)_{11}$
$(16)_{10}$	$(17)_9$	$(20)_8$	$(13)_{13}$	$(14)_{12}$	$(15)_{11}$
$(32)_{10}$	$(35)_9$	$(40)_8$	$(26)_{13}$	$(28)_{12}$	$(2A)_{11}$
$(64)_{10}$	$(71)_9$	$(100)_8$	$(4C)_{13}$	$(54)_{12}$	$(59)_{11}$
$(128)_{10}$	$(152)_9$	$(200)_8$	$(9B)_{13}$	$(A8)_{12}$	$(107)_{11}$
$(256)_{10}$	$(314)_9$	$(400)_8$	$(169)_{13}$	$(194)_{12}$	$(213)_{11}$
$(512)_{10}$	$(628)_9$	$(1000)_8$	$(305)_{13}$	$(368)_{12}$	$(426)_{11}$
$(1024)_{10}$	$(1357)_9$	$(2000)_8$	$(60A)_{13}$	$(714)_{12}$	$(851)_{11}$
$(2048)_{10}$	$(2725)_9$	$(4000)_8$	$(C17)_{13}$	$(1228)_{12}$	$(15A2)_{11}$

Next it will show that the digital root of a number depends on what kind of a numerous system we employ.

As to number 1024, it is written as $(1024)_{10}$ in decimal system, and its digital root in this numerous system is $(7)_{10}$ because $(1)_{10}+(0)_{10}+(2)_{10}+(4)_{10}=(7)_{10}$.

As to number 1024, it is written as $(1357)_9$ ($(1357)_9 = (1024)_{10}$) in base-9 numerous system, and its digital root in this numerous system is $(8)_9$ because $(1)_9+(3)_9+(5)_9+(7)_9=(17)_9$ (note that $(1)_9+(3)_9+(5)_9+(7)_9 = (1)_{10}+(3)_{10}+(5)_{10}+(7)_{10} = (16)_{10}=(17)_9$), and $(1)_9+(7)_9=(8)_9$.

As to number 1024, it is written as $(2000)_8$ ($(2000)_8 = (1024)_{10}$) in base-8 numerous system, and its digital root in this numerous system is $(2)_8$ because $(2)_8+(0)_8+(0)_8 +(0)_8 =(2)_8$.

Now we see that for number 1024, its digital root changes as the numerous system employed changes.

In Table 8, it shows that there are different patterns of the digital roots of the elements of the sequence {1, 2, 4, 8, 16, 32, 64, 128, 256…} in different numerous systems. In decimal system the repeated pattern of the digital roots is 1, 2, 4, 8, 7, 5, 1, 2, 4, 8, 7, 5…. In base-9 numerous system, there is no repeated pattern. In base-8 numerous system, the repeated pattern is 1, 2, 4, 1, 2, 4…. In base-13 numerous system, the repeated pattern is 4, 8, 4, 8, 4, 8….. In base-12 numerous system, the repeated pattern is 1, 2, 4, 8, 5, A, 9, 7, 3, 6, 1, 2, 4, 8, 5, A, 9, 7, 3, 6…. In base-11 numerous system, the repeated pattern is 2, 4, 8, 6, 2, 4, 8, 6….

Table 8: Different patterns of the sequence of the digital roots of the elements of the sequence {1 , 2 , 4, 8 , 16..} in different numerous systems

Number	Digital Root					
	Decimal system	Base-9 system	Base-8 system	Base-13 system	Base-12 system	Base-11 system
1	$(1)_{10}$	$(1)_9$	$(1)_8$	$(1)_{13}$	$(1)_{12}$	$(1)_{11}$
2	$(2)_{10}$	$(2)_9$	$(2)_8$	$(2)_{13}$	$(2)^{12}$	$(2)_{11}$
4	(4)10	$(4)_9$	$(4)_8$	$(4)_{13}$	$(4)_{12}$	$(4)_{11}$
8	$(8)_{10}$	$(8)_9$	$(1)_8$	$(8)_{13}$	$(8)_{12}$	$(8)_{11}$
16	$(7)_{10}$	$(8)_9$	$(2)_8$	$(4)_{13}$	$(5)_{12}$	$(6)_{11}$
32	$(5)_{10}$	$(8)_9$	$(4)_8$	$(8)_{13}$	$(A)_{12}$	$(2)_{11}$
64	$(1)_{10}$	$(8)_9$	$(1)_8$	$(4)_{13}$	$(9)_{12}$	$(4)_{11}$
128	$(2)_{10}$	$(8)_9$	$(2)_8$	$(8)_{13}$	$(7)_{12}$	$(8)_{11}$
256	$(4)_{10}$	$(8)_9$	$(4)_8$	$(4)_{13}$	$(3)_{12}$	$(6)_{11}$
512	$(8)_{10}$	$(8)_9$	$(1)_8$	$(8)_{13}$	$(6)_{12}$	$(2)_{11}$
1024	$(7)_{10}$	$(8)_9$	$(2)_8$	$(4)_{13}$	$(1)_{12}$	$(4)_{11}$
2048	$(5)_{10}$	$(8)_9$	$(4)_8$	$(8)_{13}$	$(2)_{12}$	$(8)_{11}$
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.

4. The digital root of the sum of the interior angles of a N-side polygon in different numerous systems

In decimal system, number 9 represents the end of the universe described by this numerous system. In figure 5 it is shown that in a universe described by decimal system, if two straight lines are perpendicular, they intersect at a $(90)_{10}$-degree angle, shown in figure 3, and there are $(360)_{10}$ degrees in a circle. The digital root of the number 360 in decimal system is 9(3+6+0=9). For an N-side polygon (which is a closed plane figure bounded by straight lines) in decimal system, the sum of the interior angles is equal to

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$(N_{side}-2)\times 180$ degrees, where N_{side} is greater or equal to 3. It can be found that the digital root of the sum of the interior angles of an N-side polygon is always 9. For example, the sums of the interior angles of a triangle , quadrilateral, and pentagon in decimal system are $(180)_{10}$ ($(1)_{10}+(8)_{10}+(0)_{10}=(9)_{10}$), $(360)_{10}$ (3+6+0=9), $(540)_{10}$ (5+4+0=9) respectively. The congruence-based explanation is that:

$$(N_{side}-2)\times 180 \equiv 0 \pmod 9,\ N_{side}\geq 3 \qquad (2)$$

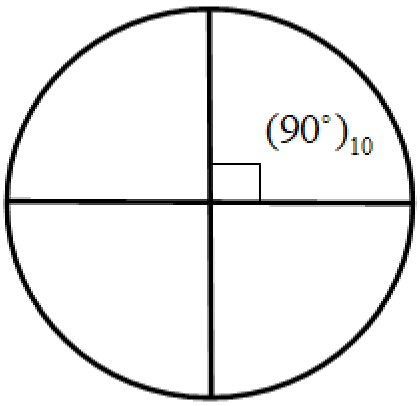

Figure 5: A circle in a universe described by decimal system

In base-9 numerous system, the number 8 represents the end of the universe described by this numerous system. In this universe there are $(385)_9$ degrees ($(385)_9=(320)_{10}$) in a circle and if two straight lines are perpendicular, they intersect at a $(80)_9$ degrees angle shown in figure 6. The digital root of the number $(385)_9$ is $(8)_9$ because $(3)_9+(8)_9+(5)_9=(17)_9$, and $(1)_9+(7)_9=(8)_9$

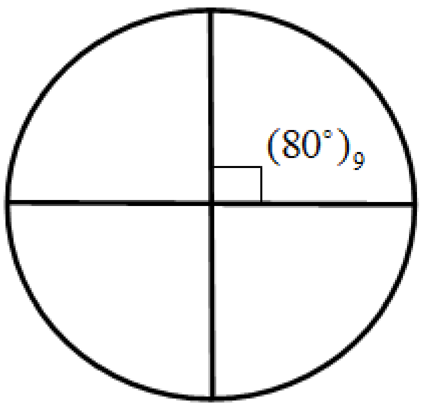

Figure 6: A circle in a universe described by base-9 numerous system

For a N-side polygon in base-9 numerous system, the sum of the interior angles is equal to $(N_{side}-2)\times 160$ degrees, where N_{side} is greater or equal to 3. It can be found that the digital root of the sum of the interior angles of an N-side polygon is always 8. For example, the sums of the interior angles of a triangle, quadrilateral, and pentagon in base-9 system are $(160)_{10}$ ($(160)_{10}=(187)_9$, $(1)_9+(8)_9+(7)_9=(17)_9$, $(1)_9+(7)_9=(8)_9$), $(320)_{10}$ ($(320)_{10}=(385)_9$, $(3)_9+(8)_9+(5)_9=(17)_9$, $(1)_9+(7)_9=(8)_9$), $(480)_{10}$ ($(480)_{10}=(583)_9$, $(5)_9+(8)_9+(3)_9=(17)_9$,$(1)_9+(7)_9=(8)_9$) respectively. The congruence-based explanation is that:

$$(N_{side}-2)\times 160 \equiv 0 \pmod 8,\ N_{side}\geq 3 \qquad (3)$$

In base-8 numerous system, if two straight lines are perpendicular, they intersect at a $(70)_7$-degree angle and there are $(280)_7$ degrees in a circle. In base-11, base-12, base-13 numerous systems, if two straight lines are perpendicular, they intersect at the angles of $(100)_{11}$, $(110)_{12}$, $(110)_{13}$ degrees respectively and in a circle there are $(400)_{11}$, $(440)_{12}$, $(480)_{13}$ degrees respectively. For a N-side polygon in base-8 numerous system, the sum of the interior angles is equal to $(N_{side}-2)\times 140$ degrees, and the digital root of the number $(N_{side}-2)\times 140$ is 7 in base-8 numerous system because the number $(N_{side}-2)\times 140$ is divisible by 7.

For a N-side polygon in base-11, base-12, base-13 numerous systems, the sums of the interior angles are equal to $(N_{side}-2)\times 200$ (whose digital root is 10 (denoted as A) in base-11 numerous system because it is divisible by 10), $(N_{side}-2)\times 220$ (whose digital root is 11(denoted as B) in base-12 numerous system because it is divisible by 11), $(N_{side}-2)\times 240$ (whose digital root is 12 (denoted as C) in base-13 numerous system because it is divisible by 12) degrees respectively. The congruence-based explanations are that:

$$(N_{side}-2)\times 140 \equiv 0 \pmod 7,\ N_{side}\geq 3 \qquad (4)$$

$$(N_{side}-2)\times 200 \equiv 0 \pmod{10},\ N_{side}\geq 3 \qquad (5)$$

$$(N_{side}-2)\times 220 \equiv 0 \pmod{11},\ N_{side}\geq 3 \qquad (6)$$

$$(N_{side}-2)\times 240 \equiv 0 \pmod{12},\ N_{side}\geq 3 \qquad (7)$$

The digital roots of the sum of the interior angles of polygons with different side numbers in different numerous

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systems (decimal, base-9, base-8, base-13, base-12, base-11) are shown in Table 9.

Next, a proof that the digital root of the sum of the interior angles of a polygon in base-N numerous system is equal to N-1 will be given.

The proof starts from that in a base-N numerous system, a right angle is ($(N\text{-}1)0)_N$, which is equal to N(N-1) because $((N\text{-}1)0)_N = (N\text{-}1) \times N^{2-1} + 0 \times N^{1-1} = (N\text{-}1) \times N$, and the sum of the interior angles of a triangle is $2(N\text{-}1) \times N$ degrees (which is two times of a right angle).

Denote the vertices points of a N-side polygon as V_1, V_2, $V_3 \ldots V_{Nside}$, as shown in figure 7

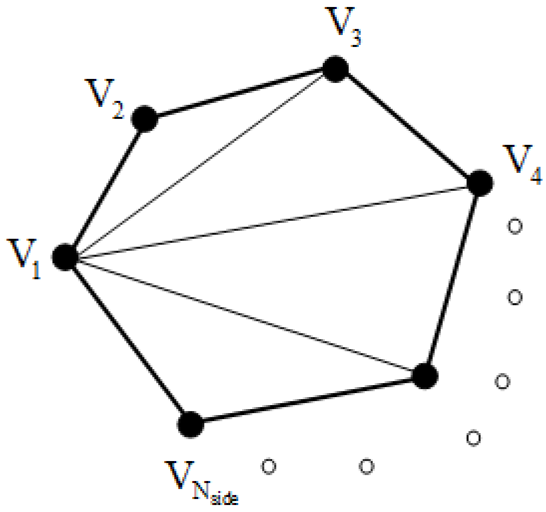

Figure 7: A polygon with side number of N_{side}

Constructing diagonals from the vertex V_1 to other vertices forms N_{side}-2 triangles. Since the sum of the interior angles of a triangle in base-N numerous system is $2(N\text{-}1) \times N$ degrees, the sum of the interior angles of the polygon in the base-N numerous system is $2(N\text{-}1) \times N \times (N_{side} - 2)$ whose digital root in the base-N numerous system is N-1 because it is divisible by N-1.

Table 9: Digital Root of the Sum of the Interior Angels of a Polygon in Different Numerous Systems

Side Number of Polygon	Digital Root of Sum of Interior Angles of a Polygon in Different Numerous Systems					
	Decimal system	Base-9 system	Base-8 system	Base-13 system	Base-12 system	Base-11 system
3	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
4	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
5	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
6	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
7	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
8	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
9	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$
10	$(9)_{10}$	$(8)_9$	$(7)_8$	$(C)_{13}$	$(B)_{12}$	$(A)_{11}$

5. Conclusion

It is found that the reason why there are privileges for the three numbers of 3, 6, and 9 is the employment of decimal system. The privileges of the three numbers may disappear when we change to a different numerous system. For a process {1, 2, 4, 8, 16, 32, 64, 128…}, the patterns of the digital roots of the elements appear differently in different numerous systems. In a base-N numerous system, a right angle is N(N-1) degrees and the digital root of the sum of the interior angles of a polygon is N-1.

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