

The Derivative, Semiotic and Semantic Analysis of Proto-Indo-European Numerals

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Abstract: This article reveals about foundation of the graphic form and content of Proto-Indo-European numerals from the derivative, semantic and semiotic viewpoint, taking into account the significance of numerals in the public life. According to the author the numerals are social and sacred issue. Their main evolution movement starts from biological and social need of a man who formed them for counting and sharing, arranging object of reality. The man created structure and content from offhand things and parts of the body, it brings to ionizing of numerals, later to conventional symbols. Long time passed and at the present time here are people and scientists who consider them sacred, who naturally founded units. But here both factors are considered crucial for basis of numbers.

Key words: icon, sign, symbol, form, meaning, biological need, social need, numerals, number, Arabic numeral, proto-Indo-European numerals, derivative, semiotic and semantic.

1. Numerals and numbers play very significant role in people's everyday life and relations among them, as it was in the past. Without numbers, it wouldn't be clear the realization of the essence of people themselves and their social life, creation of the reality and the universe. Generally everything is connected with numbers. However, numbers have been around everywhere and all the time, their relevance in the modern world is becoming increasingly central. All modern technologies are associated with numbers, and are called digital, all information is stored in a digital format. The world of numbers is very mysterious and interesting that's why it was interesting for me to investigate as much as possible about the origin of numbers, about their significance in our lives.

The magical properties of numbers have excited people for thousands of years. Not only linguists, but also common people have always been fascinated by numbers. Some of them considered sacred while others consider it as basic element of numerals which are used for social purpose as counting, measuring, ranking, comparing quantities and solving equations. In order to realize the real nature of the numerals, it should be investigated in its form and meaning which shows its beauties, holiness, the magical features. Taking into account complicatedness of numerals, much were lost and still remain unknown, it was investigated by different scientific fields as linguistics, philosophy, religion, mythology, cognitive studies, history, etymology and etc. At the present time numerals are simply in use, but its form and meaning are still unclear. The present-day knowledge concerning numerals quite obscure, the investigation from different perspective in fact may mean quite different reality. That's why it is going to be investigated theoretically and practically from semantic and semiotic

perspective even much investigation has been done in terms of the form and meaning of numerals. So, the relevance of my research is connected with proto-Indo-European numerals and its sacredness.

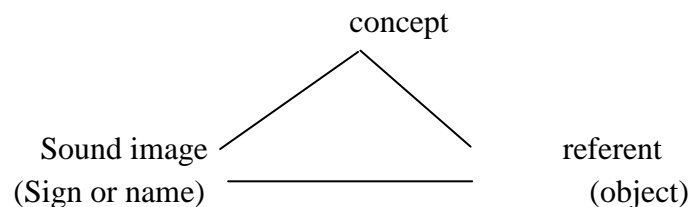
II. Literature Review

In everyday social relations, based on human needs, numbers are formed from counting and arranging objects of reality. Despite the fact that they have different forms, they have been used for a single goal and task since ancient times.

But their forms and meaning have changed at different stages of their historical development. As much time passed by there are different interpretations of the form and meaning of numerals today. Many scientific works have been done on numerals, still much can be obtained based on nature of numbers and their representation through signs.

A sign is anything that communicates a meaning that is not the sign itself to the interpreter of the sign. According to Peirce 'we think only in signs' and "We seem as a species to be driven by a desire to make meanings: above all, we are surely *Homo significantis* - meaning-makers. Distinctively, we make meanings through our creation and interpretation of 'signs'. Indeed, according to Peirce, 'we think only in signs' [5, 2.302]. By the definition of Ch. Morris "*Human civilization is dependent on signs and systems of signs and the human mind is inseparable from the functioning of signs*" [2, 1.,22].

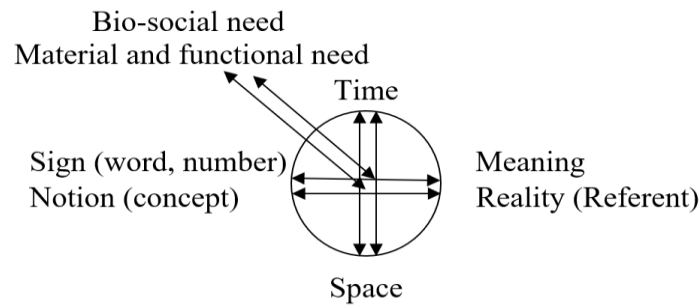
Going further talking about the sign, it should be mentioned the famous Swiss linguist Ferdinand de Saussure who interpreted the relations between sign and its meaning, in his work he divides the sign into two distinct components: the signifier ('sound-image') and the signified ('concept') [2, 4]. For Saussure, the signified and signifier are purely psychological: they are form rather than substance [3, 22-26]. From his work there are three units which have interrelations among them.



But, according to Arnold I.V. the relation between the lexical meaning and the logical notion deserves special attention not only because they are apt to be confused but also because in comparing and contrasting them it is possible to achieve a better insight into the essence of both. And Arnold I.V. gave 6 differences in his work [1.42-47].

Foundation of the form, meaning and sound-image form of numbers are intricate, because of different place, time, people, their level of consciousness, languages and culture. E. Cassirer concluded that "without symbols a person's life is likened to a prisoner's life of Plato's cave limited by his biological needs and practical interests. Then the individual will not be able to access the "ideal world", which opens from different sides – religion, art, philosophy and science [4,487].

In view of aptness, I decided to locate here another form from my previous work which were used for explanation of relations among units, taking into account innate mechanisms of human cognition, perception, process of knowing, comprehension and interpretation through language, signs. "Notions are our understanding concerning reality, but lexical meaning appears when we decide to convey certain notions and ideas through language units [8, 4771-4777]. Here is the form which shows the relations among them and express the way it works.



This form is universal in terms of cognitive processes of understanding reality, all aspect of interrelationships among units. And all these aspects of numbers interconnected and interdependent.

1. Human bio-need and social need
2. Time and place
3. Reality (objects and processes) and notions (ideas)
4. Sign (word, number) and meaning(content)

As it is mentioned above humans have innate mechanism which assimilate step by step and recreate the world we live. Human understand reality in own way, creates concepts in mind, keep notions, expressions, ideas in memory concerning reality. As a result, database about reality expressed by different signs of words and numbers. These signs start getting meaning and different meaningful realities appear in minds of human. In case of numbers, human bio-social need makes cognition counting objects and processes then express them through signs (numbers) and the meaningful numbers appear.

Peirce proposed three forms of the sign related in different ways to the Object, and labelled them Icon, Index and Symbol. Prototypically, an *Iconic* sign is one that relates to its Object via a relationship of likeness [7, 2.276]. Agreeing with the statement of Pierce, it should be mentioned that in a course of time some Icons were polished in the form and become symbols.

Societies used different ways and different tools for counting, they started using their own bodies, parts of bodies, fingers, hands, feet, eyes, ears, at the same time the objects around which are readily available in natural setting. The need to preserve information about the quantities of things, understanding the sequence of actions caused the foundation of the iconic representation of numbers. As a result, appeared different kind of numbers and numeral systems in different societies.

III. Research problem

These numeral systems go long time back, some of them remained, some of them lost. According Georges Ifrah the Indo-European, Semitic and Mongolian words for the first ten numbers derive from expressions related to finger-counting. But this is an unverifiable hypothesis, since the original meaning of the names of the numbers have been lost [6,22].

If it is lost, it doesn't mean forever or it can be restored. It is possible to reestablish original meaning from reserved data or attach a new. The works of scientists help us to do that. Specifically, it should be noted here that Zaidan Ali Jassem in his work "The Arabic origins of numeral words in English and European languages" showed that numerals are related to and derived from one another. It plays crucial role in realizing form and meaning of Indo-Arabic numerals, because he examined the genetic relationship between all numeral words in Arabic and primarily other European languages. He concludes in his work that "one can say with confidence that Arabic is the origin of all European numerals [10, 225-241].

Georges Ifrah noted that the first ten numbers derive from expressions related to finger-counting, but until it is proved we aren't agreeing with him. But there are some other societies which adopted finger counting numerals. For example, the Gupta numerals were prominent during the time ruled by the Gupta dynasty and were spread throughout that empire as they conquered lands during the

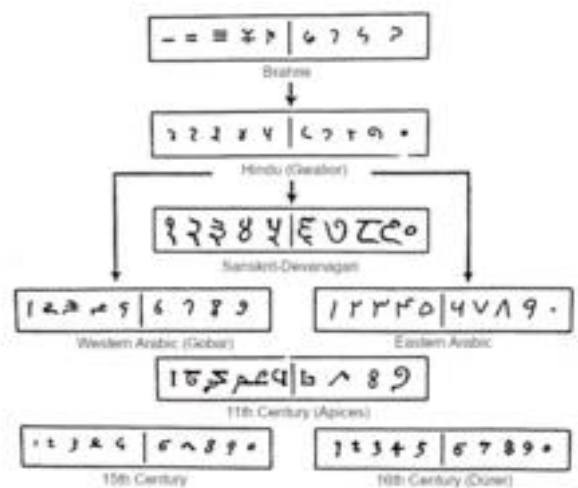
4th through 6th centuries. They have the following form:

						7	8	9
						I	I	III
I	I	II	I	II	II	III	III	III
			I	II	II	I	III	III

However, this is not the only social group which used finger counting. Roman’s formed numerals as a result of counting with fingers as well. It is not difficult to understand even today, how Romans formed numerals with the help of fingers. One – I, two – II, three – III, Four – IIII, Five – IIIII and the rest number still 10. Of course, due to the presence of some psychological problems in counting, forms IV, V, and X were later changed to make it possible to distinguish them.

Such a system of vertical stick-like numerals existed in the territories of the Chinese and Mayan states, such as Egypt, Babylon, Greco-Ionian and Rome, and horizontal stick-like forms. At the same time, due to the fact that the fingers of the left hand are bent to the right // and the fingers of the right hand are bent to the left \\\, some proto-Celtic tribes had the shape of the thighs.

Next numeral is Indo-European numeral system which is connected with Semitic societies historically, but later this numeral system was called Indo-Arabic numeral system which were started to use all over the world. There were the Abjad numerals which was also called Hisab al-Jummal had been used in the Arabic-speaking world since before the eighth century. New numerological system developed and widely used after the work of Al-Kharazmi, who wrote about the "Indian number system" in the years 783-850, about the widespread use of this system. At the same time, for the first time, information about the number zero is provided. However, there is almost no information about the form of numbers from 1-9. It is necessary to emphasize that the shape and content of the numbers from 1 to 9 in these societies are not only connected with finger counting but it is formed in relation to the human body. Only 5-five is from semantic perspective has relations with five fingers. It is considered that 1-one as well is associated with a finger, but it can be connected with entire body.



From the perspective of the form and meaning Arabic numbers are still remain unknown. Through semiotic investigation looking deep at each of them give much about the numerals which help to describe the system of the Proto-Indo-European and Indo-Arabic numerals.

IV. Research Findings

The first numeral is 1 (¹) -"one" which looks like a standing man rather than a finger. And letter “P” similar to this form. The word “one” came from OE and the stem *oi- meant "single", "the only", it usually added a suffix; thus, *oi-k-os existed in Indo-Iranian from Sanskrit “eka” and from Kurdish “yak”, *oi-n-os was developed, in most European languages like Greek en, Latin unus

and some languages had the form derived from ***oi-w-os** (for instance, Avestan **aeva**). But it is clear that because of the matter of a dialect. Taking into account that numerals in these languages have got gender forms **oi-n-os**, **oy-w-os**, possibly it means "I'm a man" and "I'm a woman". In Western and Eastern Arabic numerals 1 (١) looks like the same. So (١) - "one" is a standing man. It is "Qomat" in Arabic.

The second numeral is 2 "two" in Proto-Indo-European languages, but the stem ***duwo** which mutated into ***dwo** is considered unknown. It had feminine and neuter forms as ***duwoi** / ***dwoi**. Even in many languages sound form remains nearly the same: Russian **dva**, English **two**, in Persian **du**. As I mentioned above the numeral one is connected with the man, second numeral is logically connected with that. If (١) one – a single man, and woman, 2 (٢) two – here, half leaned vertical upright slash means bowing man and woman. Even, there are some changes in the form of number 2, it is visible that it has as close as bowing image of the man. But it should be taken account that Arabic numerals divided into Eastern Arabic numerals and Western Arabic numerals. The main difference between these numerals that in eastern numerals they are written from left to right and western and Western Arabic numerals they are written from left to right. It is clear from the image of the number that because of changes from Eastern (٢) written form into western written form (٢) - 2 two appeared. But it is possible that western and eastern people worshipped in the same direction ٢ # ٢ or vice versa to other directions ٢ # ٢. Consequently, here is two forms from Eastern ٢ form, western ٢-2 form and these forms means that people from East and west are bowing and worshipping to their Creator. It's Rukuh in Arabic.

The next numeral is 3 (٣) three ***treyes** has following gender form feminine ***trisres**, neuter ***tri**. *The numeral three is widespread form of numerals with -s exists in Lithuanian **trys**, Romance languages (**tres**, **trois**) within Indo-European languages. And the sound form somehow like **tri** exists practically in every Indo-European tongue.* In Western Arabic numeral 3 three (٣) looks like a bowing man down. So, in Eastern Arabic the iconic shape of number three is like this (٣). If this form is observed, it looks like a bowing a man up to the ground. The vertical upright slash (I) settled as a man; upside particle expresses its bowing. Thus, it can be said that it is third step of worshipping. It's Sajda.

Another form of Arabic numeral is 4 four - (٤) which is called four ***kwetwores**, with the structure ***kw** turns into in each language (Latin **quattuor**, but Oscan **petir**) in the Indo-European and Gamkrelidze and Ivanov in their book "Indo-European and Indo-Europeans" state that the count in the Proto-IE language was quaternary (in fours). If we pay attention to Western Arabic number 4 (٤), it looks like a man rising up from bowing in praying. The iconic shape of Eastern Arabic numeral 4 (٤) looks like in a position of a man is sitting on two feet taking two hands from earth. Sum of it would be four. So, it is fourth step of worshipping. It is Jalsa in Arabic worshipping.

In Indo European languages the ***penkwe** 5 (٥) was the fifth numeral and it is considered that it means "5 fingers" of the hands and feet. There are many words in the languages of Indo-European family which express that meaning. The English word pentagon means 5 angles, the Slavic word **pyat'** meaning the hand, and **pyat'** meaning five. In the western Arabic numeral icon number (٥) looks like a hand with palm. From western Arabic icon 5 (٥), it looks like the person sitting properly in praying putting 5 fingers of hands and feet is accurate praying. Accordingly, at the end of praying the man should collect himself or herself. At the same time, it may mean benediction by rising palms at the end of praying. And its fifth step of praying. It is Dua after worshipping.

Before talking about the rest numerals from six to nine, it should be realized that logically they should be interconnected with above five, and surely with the praying. Otherwise, the meaning of numbers would be meaningless. So, after looking through forms and meaning of the numbers from 1

to 5 and from 6 to 9, I realized that numbers from 6 to 9 should be connected with another obligation of religion. Usually praying and charity go together all the time in all religions. Praying is accepted in case of sharing from income of every religious man with needy people for the sake of Creator. So, next numbers are connected with charity.

The next number of investigations become numeral 6 (٦), which consist of the vertical upright slash (I) and upper part of it, If (I) means a man; upper part of it means relations of a man with Creator. The origin of the numeral 6 (٦) - **sweks* (the dialectal form **seks*) of is considered unknown. But it can be resolved from above mentioned that the form of Arabic number 6 (٦) meant a man who had built relation with Creator. It is Bina' ealaqat and Liakun qariban in Arabic.

From logical sequence of the numeral 7 (٧) seven, the symbol of this number it seems that a man is asking by rising hands from Creator own share, portion (risq). From this numeral's stem- **sept@m* the meaning is still unknown and but some words from English language "septa" means a dividing wall or membrane especially between bodily spaces or masses of soft tissue. And the word "septate" means divided by or having a septum. The creator divides the portion (the risq) of a man who asks be rising hand. It means asking Risq.

Next numeral is 8 (٨) connected with the word **októ* which is still under the discussion of linguists. Scientists couldn't give any appropriate explanation to the word and its form. **októ* in dictionaries defined as consisting of eight members or of groups containing eight. Mostly linguists pay attention to number here, possible it is connected with consisting and containing, or may mean collecting, gathering. So, by looking through the form of Arabic number number 8 (٨), I found out that this symbol (٨) shows "the place of wealth". Logically, there is possibility of 7 (٧) and 8 (٨) which are connected with above taking portion from creator by hands and sharing it with needy people. From above explanation it is the most suitable and correct possible meaning. It is Sadaqa.

The last numeral is ٩ nine **new@n*, that's all what I understood from other sources that the stem **newo-* meaning *new* - the new cycle after "eight" is a possible meaning. *It remained still unknown.* If it is paid attention to the form of nine (٩), here are the vertical upright slash (I) a man and circle (0) eternity, mean probably a man who connected with its eternal Creator. It expresses a man meets own creator after praying and giving share of needy people. It is Al-taqaa in Arabic language. Ionize

V. Summary

It is concluded that the foundation of numerals is connected with human's biological and social needs, they formed numbers from counting and arranging objects of reality. The man created structure and content of numerals from offhand things and parts of the body. Later it brought to converting of iconic numerals into conventional symbols.

Semantic analysis provided not so much while investigation from semiotic perspective presented much knowledge concerning numerals.

There were historical relations of the Proto-Indo European numerals as the Indo-European, Semitic and Mongolian numeral systems. Numeral system developed and widely used after the work of Al-Kharazmi "Indian number system". There was great impact of Indian number system into formation of two, Western Arabic numeral system and Eastern Arabic numeral system.

From semantic and semiotic analysis, the following research result have been obtained about the form and meaning of Arabic numerals:

Arabic numerals are iconic from their formation. It is true that the forms of numerals are symbolic at the present time, but the shape changed in a cause of time. Their form is connected with image of people; they came out from body parts of a man, a man's actions in praying and from the relation of a man with Creator. It is not only connected with fingers.

Another important point is that, **Proto-Indo-European numerals** has got two forms Eastern Arabic numerals and Western Arabic numerals. It shows that probably people of East and west worshipped into the same direction. That's why here are differences between Eastern and western Arabic numeral systems.

Written form of numerals and time impacted on the form and occurred some changes in form of numbers, iconic numerals became symbolic. Western Arabic numerals became more symbolic, and Eastern Arabic remained iconic.

All numbers have logical sequence and they are interconnected.

As semantic and morphological investigation couldn't clarify the meaning of numbers, semiotic interpretation of icons, image and symbols dealt with them.

Generally, from 1 to 5 connected with worshipping and from 6 to 9 is connected with charity, giving share of needy people.

So, sacredness of Indo-Arabic numbers is that it is connected with worshipping of people in the territories where this numeral system is formed.

It is known that worshipping comes with charity all the time.

1 (١) "one" – is a standing man. It is "Qomat" in Arabic.

2 (٢) "two" – are bowing and worshipping to their Creator. It's Rukuh in Arabic.

3 (٣) "three" – looks like a bowing man up to the ground. It's Sajda.

4 (٤) "four" – looks like a man in a position of sitting on two feet taking two hands from earth. Its sum of two feet and two hands. It is Jalsa in Arabic.

5 (٥) "five" – the person sitting properly in praying putting 5 fingers of hands and feet accurately. At the same time, it may mean benediction by rising palms at the end of praying. Its fifth step of praying and doing Dua after worshipping.

6 (٦) "six" – means that a man has built relation with own Creator. It is Liakun qariban in Arabic.

7 (٧) "seven" – human asking by rising hands from Creator own share, portion. It means asking Risq.

8 (٨) "eight" – by lowering hands sharing income with needy people. It means Sadaqa.

9 (٩) "nine" – the vertical upright slash (I) and circle (O) means probably a man who meets own Creator. It is Al-taqaa in Arabic language.

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