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THE QURANIC NARRATIVES ON PRIMORDIAL NUMBERS/NUMERALS

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ABSTRACT

Several Quranic Narratives reveal not only the initial ten numbers from Zero to Nine and higher numbers ranging from ten to one hundred thousand but also the fractional numbers including one eighth, one fourth, one sixth, one third, two third and one half. In the current paper the Quranic narratives which yield various numbers have been identified. From some narratives, even the concept of negative numbers may be deduced. In addition, some narratives show simple mathematical functions like addition, subtraction, multiplication and equating. This confirms the comprehension of all numbers/ numerals and fractions by the Arabs of that era. It is also shown in the current paper how all the primordial numerals could have been linked or derived from the primordial numbers that exist in the Quran. The investigation reveals that the history of numbers and numerals development does not show any reference of the holy Quran or of the early Muslim scholars. This could be due to non-documentation by the scholars of that period or deliberate destruction or change of the early documents on numbers/ numerals by the anti-Islamic powers. The Indian Mathematicians also contributed some knowledge to advance the development of the primordial numerals. The history of numerals shows that all the major contributions in advancing the development of the primordial numerals were made by Muslim Mathematicians.

INTRODUCTION

Before starting any discussion, we need to clarify the definitions of number, numeral, glyph and a digit.

Number: A number is defined as a count or measurement that is perceived as an idea in our minds. We can show our idea of a number by using the fingers of our hands. For example, the number three can be shown by holding up three fingers. Similarly, we can show other simple numbers by using our fingers.

Numeral: When a number is written in the form of a symbol it is then called a numeral. Thus, the symbol **4** is a numeral of number "four". Similarly, **3**, **19** and **153** are all numerals.

Glyph: A numeral can be written in different ways or styles. Each style or shape of a certain numeral is called a glyph of that numeral. Thus ۳ is the Urdu glyph of the numeral three while **3** is its glyph in English language. Further discussion on glyph is presented at the end of this paper.

Digit: A digit is a single symbol in a multi-digit numeral. Digits are used to make numerals. There are only ten digits which are used to make various numerals and these are:

0, 1, 2, 3, 4, 5, 6, 7, 8 and **9**

In individual form a digit is a numeral too. For example, the digit **5** is also the numeral of number **five**.

However, in the numeral **753** the **7** is only a digit and not a numeral. Similarly, **5** and **3** are just digits and not numerals. We can say that the numeral **753** is made up of three digits **7, 5** and **3**.

Most people do not know the distinction between a "Number" and a "Numeral". So, in general conversation and writings people consider the meaning of both words to be the same.

Roman Numerals

Roman Numerals are also used sometimes while writing a document. The following are examples of few Roman numerals:

The Roman numeral **I or (i)** is used for number **one.**
II or (ii) is used for number **two,**
III or (iii) is used for number **three,**
IV or (iv) is used for number **four** and
X or (x) is used for number **ten.**

The Numbers Existing in the Quran

In the Quranic narratives, not only all the basic single digit numbers (from zero to nine) exist but many higher numbers are also mentioned. In addition, many fractional numbers are also found in the Quranic narratives. Since the Quran was revealed in Arabic on Prophet Muhammad (saw) who lived among Arabs of Mecca and 'Madina', it indicates beyond any doubt that the Arabs of that era understood those numbers and their numerals (and glyphs) in whatever shape they existed at that time.

Now let us see in which Quranic[1] narratives the various numbers appear.

Number Zero

لَآ إِلَٰهَ إِلَّا ٱللَّهُ (١٩)

There is none worthy to be worshipped except Allâh (Muhammad-47:19)

In this verse the word لَآ means none, nothing or **Zero**.

Number One

إِنَّ إِلَٰهَكُمْ لَوَٰحِدٌ (٤)

Verily your Lord is indeed One (As-Saaffat-37:4)

Numbers One, Two, Three and Four

وَإِنۡ خِفۡتُمۡ أَلَّا تُقۡسِطُواْ فِي ٱلۡيَتَٰمَىٰ فَٱنكِحُواْ مَا طَابَ لَكُم مِّنَ ٱلنِّسَآءِ مَثۡنَىٰ وَثُلَٰثَ وَرُبَٰعَ فَإِنۡ خِفۡتُمۡ أَلَّا تَعۡدِلُواْ فَوَٰحِدَةً

And if you fear that you shall not be able deal justly with the orphan girls, then marry other women, who seem good to you, two or three or four; and if you fear that you shall not be able to deal justly with them then (marry) only one (An-Nisa-4:3)

Numbers Three, Four, Five, Six, Seven, Eight

ۖ سَيَقُولُونَ ثَلَٰثَةٞ رَّابِعُهُمۡ كَلۡبُهُمۡ وَيَقُولُونَ خَمۡسَةٞ سَادِسُهُمۡ كَلۡبُهُمۡ رَجۡمَۢا بِٱلۡغَيۡبِ وَيَقُولُونَ سَبۡعَةٞ وَثَامِنُهُمۡ كَلۡبُهُمۡ

(Some) say they were three, the dog being the fourth among them; and (others) say they were five, the dog being the sixth, guessing at the unseen; (yet others) say they were seven, the dog being the eighth (Al-Kahf-18:22)

Number Six

إِنَّ رَبَّكُمُ ٱللَّهُ ٱلَّذِي خَلَقَ ٱلسَّمَٰوَٰتِ وَٱلۡأَرۡضَ فِي سِتَّةِ أَيَّامٖ

Indeed, your Lord is Allâh, Who created the heavens and the earth in Six Days (Al-Aaraf-7:54)

Number Seven

ثُمَّ ٱسۡتَوَىٰٓ إِلَى ٱلسَّمَآءِ فَسَوَّىٰهُنَّ سَبۡعَ سَمَٰوَٰتٖ

Then He rose over towards the heaven, and made them seven heavens. (Al-Baqra-2:29)

Number Eight

وَيَحۡمِلُ عَرۡشَ رَبِّكَ فَوۡقَهُمۡ يَوۡمَئِذٖ ثَمَٰنِيَةٞ

And eight (angels) will bear that day the Throne of your Lord above them. (Al-Haqqa-69:17)

Number Nine

وَلَقَدۡ ءَاتَيۡنَا مُوسَىٰ تِسۡعَ ءَايَٰتِۭ بَيِّنَٰتٖ

And indeed, We gave Moses nine clear signs (of Allah's Sovereignty). (Al-Isra-17:101)

Number Ten

مَن جَآءَ بِٱلۡحَسَنَةِ فَلَهُۥ عَشۡرُ أَمۡثَالِهَا

Whoever brings a good deed shall have ten times the like thereof to his credit (Al-Anaam-6:160)

Number Twelve

وَإِذِ ٱسْتَسْقَىٰ مُوسَىٰ لِقَوْمِهِۦ فَقُلْنَا ٱضْرِب بِّعَصَاكَ ٱلْحَجَرَ فَٱنفَجَرَتْ مِنْهُ ٱثْنَتَا عَشْرَةَ عَيْنًا

And when Moses asked for water for his people, We said: Smite with thy staff the rock. And there gushed out therefrom twelve springs (Al-Baqra-2:60)

Numbers Twenty, Hundred, 2 Hundred and Thousand

إِن يَكُن مِّنكُمْ عِشْرُونَ صَـٰبِرُونَ يَغْلِبُوا۟ مِاْئَتَيْنِ وَإِن يَكُن مِّنكُم مِّاْئَةٌ يَغْلِبُوٓا۟ أَلْفًا مِّنَ ٱلَّذِينَ كَفَرُوا۟

If there are twenty steadfast persons amongst you, they will overcome two hundred, and if there be a hundred steadfast persons they will overcome a thousand of those who disbelieve. (Al-Anfal-8:65)

Number Fifty

وَلَقَدْ أَرْسَلْنَا نُوحًا إِلَىٰ قَوْمِهِۦ فَلَبِثَ فِيهِمْ أَلْفَ سَنَةٍ إِلَّا خَمْسِينَ عَامًا

And indeed We sent Nûh (Noah) to his people, and he stayed among them a thousand years less fifty years. (Al-Ankaboot-29:14)

Number Seventy

إِنتَسْتَغْفِرْ لَهُمْ سَبْعِينَمَرَّةً فَلَنيَغْفِرَ ٱللَّهُلَهُمْ

If you ask seventy times for their forgiveness (O Muhammad) Allâh will not forgive them. (Al-Tawba-9:80)

Number Three-Hundred-Nine

وَلَبِثُوا۟ فِى كَهْفِهِمْ ثَلَـٰثَ مِاْئَةٍ سِنِينَ وَٱزْدَادُوا۟ تِسْعًا

And they stayed in their Cave three hundred years, and adding nine (Al-Kahf-18:25)

Number Hundred-Thousand

وَأَرْسَلْنَـٰهُ إِلَىٰ مِاْئَةِ أَلْفٍ أَوْ يَزِيدُونَ

And We sent him to a hundred thousand (people) or even more. (As-Saffat-37:147)

Fractional Numbers

۞يُوصِيكُمُ ٱللَّهُ فِىٓ أَوْلَـٰدِكُمْ
۞ وَإِن كَانَتْ ۚ فَإِن كُنَّ نِسَآءً فَوْقَ ٱثْنَتَيْنِ فَلَهُنَّ ثُلُثَا مَا تَرَكَ ۖ لِلذَّكَرِ مِثْلُ حَظِّ ٱلْأُنثَيَيْنِ ۚ فَإِن ۚ وَلِأَبَوَيْهِ لِكُلِّ وَٰحِدٍ مِّنْهُمَا ٱلسُّدُسُ مِمَّا تَرَكَ إِن كَانَ لَهُ وَلَدٌ ۚ وَوَٰرِثَهُ ۚ أَبَوَاهُ فَلِأُمِّهِ ٱلثُّلُثُ ۚ فَإِن كَانَ لَهُ إِخْوَةٌ فَلِأُمِّهِ ٱلسُّدُسُ ۚ مِّنۢ بَعْدِ وَصِيَّةٍ يُوصِى بِهَآ أَوْ دَيْنٍ ۗ ءَابَآؤُكُمْ وَأَبْنَآؤُكُمْ لَا تَدْرُونَ أَيُّهُمْ أَقْرَبُ لَكُمْ نَفْعًا ۚ فَرِيضَةً مِّنَ ٱللَّهِ ۗ إِنَّ ٱللَّهَ كَانَ عَلِيمًا حَكِيمًا ۞ وَلَكُمْ نِصْفُ مَا تَرَكَ أَزْوَٰجُكُمْ إِن لَّمْ يَكُن لَّهُنَّ وَلَدٌ ۚ فَإِن كَانَ لَهُنَّ وَلَدٌ ۚ فَلَكُمُ ٱلرُّبُعُ مِمَّا تَرَكْنَ ۚ مِّنۢ بَعْدِ وَصِيَّةٍ يُوصِينَ بِهَآ أَوْ دَيْنٍ ۚ وَلَهُنَّ ٱلرُّبُعُ مِمَّا تَرَكْتُمْ إِن لَّمْ يَكُن لَّكُمْ وَلَدٌ ۚ فَإِن كَانَ لَكُمْ وَلَدٌ ۚ فَلَهُنَّ ٱلثُّمُنُ مِمَّا تَرَكْتُم ۚ مِّنۢ بَعْدِ وَصِيَّةٍ تُوصُونَ بِهَآ أَوْ دَيْنٍ ۗ وَإِن كَانَ رَجُلٌ يُورَثُ كَلَـٰلَةً أَوِ ٱمْرَأَةٌ وَلَهُۥٓ أَخٌ أَوْ أُخْتٌ فَلِكُلِّ وَٰحِدٍ مِّنْهُمَا ٱلسُّدُسُ ۚ فَإِن كَانُوٓا۟ أَكْثَرَ مِن ذَٰلِكَ فَهُمْ شُرَكَآءُ فِى ٱلثُّلُثِ ۚ مِّنۢ بَعْدِ وَصِيَّةٍ يُوصَىٰ بِهَآ أَوْ دَيْنٍ ۙ غَيْرَ مُضَآرٍّ ۚ وَصِيَّةً مِّنَ ٱللَّهِ ۗ وَٱللَّهُ عَلِيمٌ حَلِيمٌ ۞

Allâh commands you as regards your children's (inheritance); to the male, a portion equal to that of two females; if (there are) only daughters, two or more, their share is two thirds of the inheritance; if only one, her share is half. For parents, a sixth share of inheritance to each if the deceased left children; if no children, and the parents are the (only) heirs, the mother has a third; if the deceased left brothers or (sisters), the mother has a sixth. (An-Nisa-4:11)

يُوصِيكُمُ ٱللَّهُ فِيٓ أَوۡلَٰدِكُمۡۖ لِلذَّكَرِ مِثۡلُ حَظِّ ٱلۡأُنثَيَيۡنِۚ فَإِن كُنَّ نِسَآءٗ فَوۡقَ ٱثۡنَتَيۡنِ فَلَهُنَّ ثُلُثَا مَا تَرَكَۖ وَإِن كَانَتۡ وَٰحِدَةٗ فَلَهَا ٱلنِّصۡفُۚ وَلِأَبَوَيۡهِ لِكُلِّ وَٰحِدٖ مِّنۡهُمَا ٱلسُّدُسُ مِمَّا تَرَكَ إِن كَانَ لَهُۥ وَلَدٞۚ فَإِن لَّمۡ يَكُن لَّهُۥ وَلَدٞ وَوَرِثَهُۥٓ أَبَوَاهُ فَلِأُمِّهِ ٱلثُّلُثُۚ فَإِن كَانَ لَهُۥٓ إِخۡوَةٞ فَلِأُمِّهِ ٱلسُّدُسُۚ مِنۢ بَعۡدِ وَصِيَّةٖ يُوصِي بِهَآ أَوۡ دَيۡنٍۗ ءَابَآؤُكُمۡ وَأَبۡنَآؤُكُمۡ لَا تَدۡرُونَ أَيُّهُمۡ أَقۡرَبُ لَكُمۡ نَفۡعٗاۚ فَرِيضَةٗ مِّنَ ٱللَّهِۗ إِنَّ ٱللَّهَ كَانَ عَلِيمًا حَكِيمٗا

وَلَكُمۡ نِصۡفُ مَا تَرَكَ أَزۡوَٰجُكُمۡ إِن لَّمۡ يَكُن لَّهُنَّ وَلَدٞۚ فَإِن كَانَ لَهُنَّ وَلَدٞ فَلَكُمُ ٱلرُّبُعُ مِمَّا تَرَكۡنَۚ مِنۢ بَعۡدِ وَصِيَّةٖ يُوصِينَ بِهَآ أَوۡ دَيۡنٖۚ وَلَهُنَّ ٱلرُّبُعُ مِمَّا تَرَكۡتُمۡ إِن لَّمۡ يَكُن لَّكُمۡ وَلَدٞۚ فَإِن كَانَ لَكُمۡ وَلَدٞ فَلَهُنَّ ٱلثُّمُنُ مِمَّا تَرَكۡتُمۚ مِّنۢ بَعۡدِ وَصِيَّةٖ تُوصُونَ بِهَآ أَوۡ دَيۡنٖۗ وَإِن كَانَ رَجُلٞ يُورَثُ كَلَٰلَةً أَوِ ٱمۡرَأَةٞ وَلَهُۥٓ أَخٌ أَوۡ أُخۡتٞ فَلِكُلِّ وَٰحِدٖ مِّنۡهُمَا ٱلسُّدُسُۚ فَإِن كَانُوٓاْ أَكۡثَرَ مِن ذَٰلِكَ فَهُمۡ شُرَكَآءُ فِي ٱلثُّلُثِۚ

In that which your wives leave, your share is a half if they have no child; but if they leave a child, you get a fourth of that which they leave after payment of legacies that they may have bequeathed or debts. In that which you leave, their (your wives) share is a fourth if you leave no child; but if you leave a child, they get an eighth of that which you leave after payment of legacies that you may have bequeathed or debts. If the man or woman whose inheritance is in question has left neither ascendants nor descendants, but has left a brother or a sister, each one of the two gets a sixth; but if more than two, they share in a third. (An-Nisa-4:12)

The above two verses show the following fractional numbers:

One Half, One Third, Two Third, One Sixth, One Fourth and One Eighth.

Simple Mathematical Functions

Addition or Plus (+)

وَلَبِثُواْ فِي كَهۡفِهِمۡ ثَلَٰثَ مِاْئَةٖ سِنِينَ وَٱزۡدَادُواْ تِسۡعٗا

And they stayed in their Cave three hundred years, and adding nine (Al-Kahf-18:25)

Subtraction or Minus (-)

وَلَقَدۡ أَرۡسَلۡنَا نُوحًا إِلَىٰ قَوۡمِهِۦ فَلَبِثَ فِيهِمۡ أَلۡفَ سَنَةٍ إِلَّا خَمۡسِينَ عَامٗا

And indeed We sent Nûh (Noah) to his people, and he stayed among them a thousand years less fifty years. (Al-Ankaboot-29:14)

Multiplication or (x) and Equal to (=)

إِن يَكُن مِّنكُمْ عِشْرُونَ صَـٰبِرُونَ يَغْلِبُواْ مِاْئَتَيْنِ وَإِن يَكُن مِّنكُم مِّاْئَةٌ يَغْلِبُوٓاْ أَلْفًا مِّنَ ٱلَّذِينَ كَفَرُواْ

If there are twenty steadfast persons amongst you, they will overcome two hundred, and if there be a hundred steadfast persons they will overcome a thousand of those who disbelieve. (Al-Anfal-8:65)

This verse shows that twenty times ten is equal to two hundred and hundred times ten is equal to one thousand. In other words, this narrative of the Quran can be expressed by the following equations.

20 x 10 = 200 and 100 x 10 = 1000

These equations show both multiplication and equating processes.

Equivalent or Equal to (=)

مَن جَآءَ بِٱلْحَسَنَةِ فَلَهُ عَشْرُ أَمْثَالِهَا وَمَن جَآءَ بِٱلسَّيِّئَةِ فَلَا يُجْزَىٰٓ إِلَّا مِثْلَهَا وَهُمْ لَا يُظْلَمُونَ

Whoever brings a good deed shall have ten times the like thereof to his credit, and whoever brings an evil deed shall have only the recompense of the like thereof. (Al-Anaam-6:160)

Less than (<)

نِّصْفَهُ ۥٓ أَوِ ٱنقُصْ مِنْهُ قَلِيلًا

Half of it, or a little less than that (Al-Muzammil-73:3)

More than or Greater than (>)

أَوْ زِدْ عَلَيْهِ وَرَتِّلِ ٱلْقُرْءَانَ تَرْتِيلًا

Or a little more than that; And recite the Qur'ân in a slow, and pleasant style (Al-Muzammil-73:4)

Probable Numerals in the Period of Quranic Revelations

There is no reference to indicate the type of numerals being used during the period of Quranic revelations. Probably there were different numerals used by different tribes but the traders understood the numerals used by different tribes. The Jew tribes were more educated and because they were also doing the lending business they must be using a certain numeral system. The Quran was revealed not in written form but in the recitation form. That may be the reason that no numeral was used for any Sura number or any verse number in the writings of the copies of the Quran compiled during the period of third Khalifa Hazrat Usman (RA). As a matter of fact, such practice continued till the early part of the twentieth century. This could be due to extreme precaution to not cause any kind of change whatsoever in the originality of the Quran.

Following is possibly one way how the simple numerals could have been derived. To convey the idea of number one in your mind you can hold up your index finger or draw a single vertical line on the ground. But the line drawn on the ground (or any flat material suitable to write on) becomes a written symbol and it would be the numeral of number one. Similarly, two vertical lines side by side would become numeral of number two and three vertical lines be numeral of number three. This way, the primordial Arabic and Roman numerals started. The glyphs of first three Roman numerals are still in the form of vertical straight lines, while the glyphs of Arabic numerals have been developed as shown below:

Probable Numerals for first three Numbers

Arabic:| ,|| ,||| and **Roman:**| , || **,** |||

The first stage developed forms of numerals two and three would be as follows:

Probable First Development of the Numerals

Arabic: ۱ , ۲ , ۳ and **Roman:**| , || **,** |||

Above are the true primordial numerals as per definition.

Current Shape of Glyphs of these Numerals

Arabic:١, ٢, ٣ ; **Roman:** I, II, III; **International:** 1, 2, 3

Chinese Rod Numerals[2]

The Chinese rod numerals also look like Roman numerals as shown below for the first nine numbers:

1	2	3	4	5	6	7	8	9
𝍠	𝍡	𝍢	𝍣	𝍤	𝍥	𝍦	𝍧	𝍨

Numeral of Zero

The Arabic symbol or numeral of the number Zero is probably derived from the numeral of number One (1) which is a small straight line. If we keep on reducing the length of the straight line of numeral One (1) (with the objective to reduce the length of the straight line to almost nothing), at the end of this process we will be left with a very small point and this is exactly what the Arabic numeral Zero looks like as shown below within the parenthesis:

(•)

The numeral of Zero was later developed as a small oval shaped circle.

Origin of the Word Zero[3] (0)

The origin of the word Zero meaning 'empty' is Arabic and it had been used even in the pre-Islamic time. The Arabic word (لا) too means 'empty', 'nothingness' or 'Zero'. Historically the word 'C*ipher'* or 'Sifr' has also been used for zero. In pre-Islamic times the word *ṣifr* (Arabic صفر) had the meaning as 'empty'. With time '*Sifr'* gradually evolved to mean zero. The word *zero* was adapted from French word *zéro* and its first appearance into the English language is quoted to be around 1598. The French word *zéro* came from the Italian word '*zero'*.

Numerals for Higher Numbers in the Quran

Whereas the numbers **one, two** … up to **ten** or even the number **twenty** can be shown by fingers of hands, it would be cumbersome to do the same for the number **one hundred** and it would be almost impossible to do that for the numbers like **nine-hundred-fifty** or **one hundred-thousand**. Thus, for all the numbers particularly for large numbers and fractions the people of Mecca, Madina and the surroundings must have been using symbols (or glyphs) prior to the period of Quran's revelation on Prophet Muhammad (saw). For various numbers, they must be using certain symbols (or glyphs) and those symbols were the true primordial numerals, even though they were not standardized. But surprisingly in the history of the numbers and numerals no reference has been given of either the Quran or of any mathematician of that era. Thus, if it were not the preservation of the Quran we would have never known what is missing in the history of numbers and numerals.

The Role of Quranic Revelations

It is important to note that the dates of pre-Islamic discoveries providing evidence of some numerals or glyphs are not only a few but also vague and controversial. For this reason, the historians have often used the words 'around', 'about' or 'probably' with the dates of such references. The writings of the 23 years' period (610-632 AD) of the Quranic revelations on the other hand, are known with accurate time periods thanks to the extra-ordinary preservation of the Quranic verses and the authentic Hadiths of Prophet Muhammad (saw). Another fact is that Muslim traders have been traveling regularly to India, Indonesia and Malaysia for trading purpose. No documented reports have been found to show what kind of information (besides commerce and Islamic fundamentals) these traders shared with the traders of these countries. Thus, it is in these contexts that the readers should study the historical facts described below:

1. Mathematicians of Egypt (1740 BC), Babylonia (700 AD) and ancient Greece were using Zero (0) in different ways[3] (i.e. different glyphs).
2. It is reported that around 500 CE, the Indian mathematician Aryabhata[4] devised a number system which had no zero yet it was a positional system. He used the word "*kha*" (emptiness) for position and it would be used later as the name for zero. There is evidence[4] that a dot had been used in earlier Indian manuscripts to denote an empty place in positional notation. Probably this dot system came from Arab traders since in Arabic numerals dot is still being used for zero. By interaction with the Arab traders he came to know the Arabic word (لا) which also

means “emptiness” or Zero”, and he could have changed it into a similar word of local dialect ‘*kha*’.

3. There is some vague evidence that the earliest glyphs[5] of Zero in the shape of small circles had been discovered in inscriptions on copper plates found in Indonesia (dated 683 AD), Cambodia and Gwalior, India (dated 870 AD).
   These dates indicate that the inscription written in Indonesia was few years after the Quranic revelation and the inscription found in India was written about two centuries later. The knowledge expressed in these inscriptions was probably derived from the documents or verbal knowledge expressed by the early Islamic traders.
4. There is also a reference that the Indian mathematician Brahmagupta[5] formulated zero as a number in AD 628. Considering the date of this writing and the name ‘Hindu-Arab Numerals’ in the reference it seems that Arab traders could have been involved in this process.

It is important to know that in the above cases no other number besides Zero (0) has been quoted. The Quran on the other hand not only provides the knowledge of all the real numbers including Zero but even the fractional numbers. The Biblical scriptures too show several real numbers and their significance and few fractional numbers such as one half, one fifth and one tenth. However, research in the history shows that almost all the major contributions in the field of numerals were made by Muslim mathematicians. Some credit goes to Hindu mathematicians in the positional placement of the numeral Zero in larger numerals. However, the original source of their contributions in this regard could be the early Muslim traders.

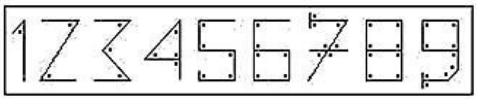
The question is that why these and other similar reports do not show any reference of the Quranic verses or the Islamic traders of early Islamic period? After the Quranic revelations, what we find in the subsequent period is references of only Hindu mathematicians. So, when Al-Khwarizmi[5,6] initiated his research on numerals in the *House of Wisdom* in Bagdad the base line of his acquired knowledge was what he could find in the available reports which were all about the achievements of Indian mathematicians. The reports on the achievements of early Muslim mathematicians or traders were missing and not available anywhere. However, in the subsequent periods starting from Al-Khwarizmi all the major contributions in the field of Mathematics including the numerals were made by Muslim mathematicians as described below:

1. Muhammad ibn Mūsā al-Khwārizmī (محمد بن موسى الخوارزمى; 780–850), a Persian[6] mathematician, and a scholar in the House of Wisdom in Baghdad wrote a book, ‘*On the Calculations with Hindu Numerals*’ in about 825.

   He stated in this book that if no number appears in the place of tens in a calculation, a little circle should be used "to keep the rows". This circle was called ‘*ṣifr*’. His book was later translated into Latin in the 12th century under the title ‘*Algoritmi de numero Indorum’*. Later the book was translated into English under the title "*Al-Khwarizmi on the Numerals of the Indians*". The word "*Algoritmi*" was the translator's Latinization of Al-Khwarizmi's name.

   Al Khawarizmi based his designing of the Arab numerals on the number of angles that each numeral should contain. For instance, the numeral of number one

contains only one angle, numeral two has two angles, numeral three includes three angles and so forth. The original glyphs of the numerals designed by Al-Khwarizmi are shown below. Each angle is identified by a dot.



These numbers were later modified in Maghreb part of the Arab until they reached the present forms in which we use them now.

2. Ya'qūbibn'Isḥāqaṣ-Ṣabbāḥ Al-Kindī[7] (from Iraq) wrote four volumes, '*On the Use of the Hindu Numerals*' (كتاب في استعمال العداد الهندي) around 830.

3. Kūshyāribn Labbānibn Bashahri Gilani, also known as Kūshyār Gīlānī[7], from Gilan, Iran. (971-1029) while doing research in Bagdad wrote 'Principles of Hindu Reckoning' (كتاب في اصول حساب الهند). (This book was published in English in 1965).

4. The Syrian mathematician Abu'l-Hasan Al-Uqlidisi included in his treatise[7] written in 952-953 CE, a reference on the use of some fractional numbers. The details of these fractional numbers are not known but this was the first such reference that was reported after more than three centuries of the Quranic revelations.

   However, the Quranic narratives indicate that the fractional numerals (or glyphs) must have been known to the Muslim mathematicians of that period. But surprisingly the Quranic narratives on fractional numbers have not been quoted in this treatise or anywhere else in the history of numerals.

5. The decimal point notation was introduced by Sind ibnAli[8], who traveled to city of Baghdad that was famous for providing the best education in those days. He also wrote the earliest treatise on Arabic numerals. He was a renowned Sindhi (i.e. from the province of Sindh) Muslim astronomer and mathematician. His father Ali-Musa was a convert to Islam who lived in Mansura, Sindh (Currently in Pakistan). Mansura (المنصورة) was the Sindhi Muslim capital in the period of 711- 1006 AD, the city was founded as a central garrison by the Umayyad Forces in Sindh.

   The Muslim Scholars in the city of Mansura produced the first translation of the Quran in the Sindhi language, which was used widely throughout the Indus region.

6. The achievements of Arab mathematicians in Baghdad were gradually passed on to the Arabs farther west. There is some evidence to suggest that the numerals in their current form (distinct in form from the Indian and eastern Arabic numerals) developed from Arabic letters in the Maghreb, the western region of the Arab world including Morocco, Algiers, Tunisia and Mauritania

Introduction of Numerals to Europe and Beyond

In the 12th century the famous Italian mathematician Leonardo Fibonacci[9] who used to visit the Muslim mathematicians of Western Arab (Al-Maghreb), learnt about the Arabic numeral system. He subsequently wrote his book '*Liber Abaci*' and introduced Arabic numerals, the use of zero, and the decimal place system to the Latin world. His work was crucial in making the Arabic numerals known throughout Europe. The Europeans then spread the use of Arabic numerals around the world through books, trade, and colonialism.

The precise shape of the glyphs of Arabic numeral at the time of introduction is not known. The familiar shape of the Western Arabic glyphs (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) as being used now with the Latin alphabet are the product of the late 15th to early 16th century.

Glyphs[5]

A **glyph** in a numeral system is an elemental symbol for a numeral within an agreed set of numerals. It shows the shape and look of a numeral. For example, the glyph of number Zero in Arabic numeral system is just a dot like (۞) while in Indo-Arabic numeral system it is like an oval shaped circle like (**0**). Similarly, the respective glyphs for number five are (٥) and (**5**). It must be noted that the early glyphs used to write numerals may have varied somewhat from region to region.

The earliest glyphs of Zero in the shape of small circles have been discovered in the inscriptions on copper plates found in Indonesia (dated 683), Cambodia and Gwalior, India (dated 870).

The glyphs most commonly used in conjunction with the Latin script since early modern times are 0123456789.

A distinctive West Arabic variant of the symbols (or glyphs) began to emerge around the 10th century in the Maghreb (The **Maghreb** or the Greater **Maghreb** is usually defined as most of the region of western North Africa including Morocco, Algeria, Tunisia and Libya) and Al-Andalus, called *ghubar* ("sand-table" or "dust-table") numerals, which are the direct ancestor of the modern Western Arabic numerals used throughout the world.

CONCLUSIONS

1. Although all the rational numbers and fractional numbers are mentioned in the Quran yet none of the researchers has mentioned the Quran and achievements of early Muslim mathematicians and traders regarding the numerals of these numbers. This could be either no documentation of the numerals being used in that era, or it could be deliberate destruction of their documents by anti-Islamic powers.
2. This resulted in an over-due credit that has been given to Hindu Mathematicians to be the pioneers in the initial work on the development of numerals. The numerals used currently are sometimes wrongly quoted as Hindu-Arabic numerals. But quite often they are referred to as Arabic numerals and that seems closer to the reality.

3. Al-Khwarizmi was the first Muslim mathematician who clearly defined how to write the numerals and limited only ten digits to formulate the numerals. Subsequently, throughout the history all the major achievements in the field of Mathematics and numerals (including the fractions) were made by Muslims mathematicians.
4. Almost all the achievements in the development of numerals were made in the period after the revelation of the Quran. There are only few vague and controversial pre-Islamic references and those are of general type and not specific.
5. Further research and investigation is needed in the history of numerals development.

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