

## HISTORY: SYMBOL OF ZERO

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### Abstract

In modern days, Ganit (mathematics) is considered a very important subject. We find very elaborate proof of this in “**Vedah**” (which were compiled around 6000 BC). Indian mathematics had its beginnings in the Bronze Age Indus Valley civilization (2600-1900 BC) and the Iron Age Vedic culture (1500-500 BC). In the classical period of Indian mathematics (400 AD to 1200 AD), important contributions were made by scholars like Aryabhata, Brahmagupta and Bhaskarya etc. Thousands of years ago, there was no symbol or word to represent something. Fingers, sticks, eyes or stones were used to represent numbers. There were no clocks or calendar to keep track of time. The sun and moon were used to distinguish different times. The ideas of numbers came slowly in human life. Though the numbers are only an abstract idea, we can't live without them. In ancient time, most of the civilizations used different types of symbols or words to represent number, without zero. After many years, astronomers, mathematicians realized the necessity of another symbol or number to represent ‘**emptiness**’ which is known as ‘**zero**’. Our purpose is to know about different types of symbol which were used as zero and how it came in final symbol “**0**”.

**Keywords :** emptiness, Vedah, Lokavibhaga, Aryabhata, silent number, Shunya

### History of Zero

As soon as the rule of position became the basis for a numbering system, most of the people of all civilization felt the need of a specific number. One of the commonest questions of all readers is: What should be that specific number? After years' speculations that specific number was recognized and that specific number was “**zero**”. But the question is who discovered zero? Where was it discovered and when ?

Philosophical speculations about “**emptiness**” might have given meaning and impetus to the concept of zero. First, the concept of zero was found in “**Vedah**”. Zero was incidentally first known as ‘**PUJYAM**’ in early Sanskrit. This was replaced by the more mundane ‘**SHUNYA**’. Jaina mathematicians were apparently the first to use the word ‘**SHUNYA**’ (literally void in Sanskrit) to refer to zero. The Arabs, however, changed the Sanskrit word ‘**SHUNYA**’ to ‘**SIFR**’ but in the 12<sup>th</sup> century, Italian mathematician Leonardo Pisano Fibonacci, after studying Arabian Algebra, introduced the Hindu-Arabic numerals in Italy, they Latinized the Arabic word ‘**SIFR**’ to ‘**ZEPHIRUM**’. In Germany when Jordanus Nemarius introduced the Arabic system of numerals, he

retained the original Arabic word, but modified it to 'CIFRA'. In England, the word 'CIFRA' became 'CIPHER'. In the early period, the new numeration incorporating "Zero" was looked upon as a secret sign by the common people.

Only the Babylonians, the Mayans and the Indians managed to develop this final abstraction number zero. The Chinese only acquired it through Indian influences. The Babylonians put two wedge (") symbols into the place where we would put zero.

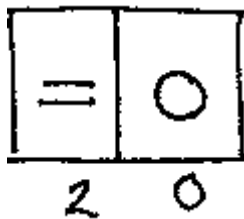


[Babylonians displayed zero with two angled wedges(middle) ]

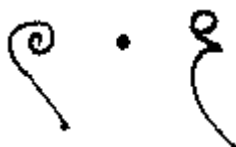
For example, the number 32"8 means 3208 .It should be noted that the symbol never occurred at the end of the number but always between two digits. So we find 54"3 but never find 543".They would not distinguish 3208 and 328 until around 400BC. So it was same meaning of 328 and 32"8. The Mayans were also the first to symbolize the concept of nothing (or zero). A shell glyph was used to symbolize zero.



[Mayans used an eyelike Character ( top left ) to denote zero]



[The Chinese started writing the open circle we now use for zero]



[The Hindus depicted zero as a dot]

However, the Babylonian and Mayan zeros were not conceived of as numbers and only the Indian zero had roughly the same potential as the one we use now a days. That is because it is indeed the Indian zero which is transmitted to us through the Arabs

together with the number symbols that we call Arabic numerals which are in reality Indian numerals.

The ancient Greeks began their contributions to mathematics around the time when zero as an empty place indicator was coming into use in Babylonian mathematics. Some genius said that the Greek astronomers first began to use the symbol "O" which we recognize today. But, the question is why they used this symbol? Some historians say that it is 'omicron', the first letter of the Greek word for 'nothing' namely "ouden". Neugebauer, however dismisses this explanation, since the Greeks already used omicron as a number. Others explained that it stands for "obol", a coin almost no value, and that it arises when counters were used for counting on a sand board. Many historians of mathematics believe that the Indian use of zero evolved from its use by Greek astronomers. Moreover, there are also some scholars who proclaim about the Indian invention of zero which seem to go far too far.

The oldest text to use zero is a 'Jain manuscript' the 'Lokavibhaga', dated 458AD. In this text the following symbolic words were used to note zero. It was first introduced to the world centuries later by 'Al-Khwarizmi', the founder of several branches of mathematics. The first apparent appearance of a symbol for zero occurred in 876 in India on a stone table in Gwalior. Documents of a small symbol 'o' on copper plates were there, dated around sixth century AD.

In around 650 AD the use of zero as number came into Indian mathematics. The Indians also used a place-value system and zero was used to denote an empty place. In around 500 AD, Aryabhata devised a number system which has no zero yet was a positional system. He used the word "Kha" for position and it would be used later as the name for "ZERO".

Later, the characteristics, properties of the number 'zero' were discussed by some great mathematicians like Brahmagupta, Mahavira and Bhaskara etc. They tried to solve all peculiar type of problems created by zero (like as  $a/0=\infty$ ,  $\sqrt{0}=0$ ,  $0^2=0$ , etc).

Still now, there are always sign problems caused by zero. Recently many people throughout the world celebrated the new millennium on 1<sup>st</sup> January 2000. Of course they celebrated the passing of only 1999 years since when the calendar was set up no year zero was specified. Although one might forgive the original error, most people are too much unable to understand why the third millennium and the 21<sup>st</sup> century begin on 1<sup>st</sup> January 2001. "ZERO" is still causing problems! So in mathematics, the problem created by zero is one of the biggest problem and we may say that 'ZERO' is a danger number.

Tobias Dantzig in 1930 commented on zero that "In the history of culture, the invention of zero will always stand out as one of the greatest single achievements of the human race".

## Conclusion

There is no doubt about the fact that zero is an important number in our life. The symbol “0” came undergoing many evaluations through the different civilizations. The first concept of zero was found in “Vedah” in the form of “PUJYAM” and later it was transformed into “SHUNYA”. Jaina mathematicians used it as zero. The Mayans were the first to symbolize zero in eyelike form. After then the Chinese used zero in open circle form. According to many mathematicians, Greek astronomers first began to symbolize zero as “o”. However, in 500AD, Aryabhata used the word “Kha” which is recently taken as zero. But, still now, we do not know who invented it and where actually it was discovered. In my opinion, it is a ‘SILENT NUMBER’ which enters in our life silently through different civilizations. It’s difficult for a modern person to imagine a life without zero. According to Alfred North Whitehead, a life without zero is that *“The point about zero is that we do not need to use it in the operations of daily life. No one goes out to buy zero fish. It is in a way the most civilized of all the cardinals, and its use is only forced on us by the needs of cultivated modes of thought”*.

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