## History of the Hindu-Arabic numeral system

A decimal place system has been traced back to c. 500 in India. Before that epoch, the *Brahmi* numeral system was in use; that system did not involve the concept of the place-value of numbers. Instead, Brahmi numerals included additional symbols for the tens, as well as separate symbols for *hundred* and *thousand*.

The Indian place-system numerals spread to neighbouring Persia, where they were picked up by the conquering Arabs. In 662, Severus Sebokht – a Nestorian bishop living in Syria wrote:

I will omit all discussion of the science of the Indians... of their subtle discoveries in astronomy ---discoveries that are more ingenious than those the discoveries of the Greeks and the Babylonians --- and of their valuable methods of calculation which surpass description. I wish only to say that this computation is done by means of nine signs. If those who believe that because they speak Greek they have arrived at the limits of science would read the Indian texts they would be convinced, even if a little late in the day, that there are others who know something of value.

The addition of zero as a tenth positional digit is documented from the seventh century by Brahmagupta, though the earlier Bakhshali Manuscript, written sometime before the 5<sup>th</sup> century, also included zero. But it is in Khmer numerals of modern Cambodia where the first extant material evidence of zero as a numerical figure, dating its use back to the 7<sup>th</sup> century, is found.

As it was from the Arabs that the Europeans called them *Arabic numerals*; the Arabs refer to them as *Indian numerals*. In academic circles they are called *Hindu-Arabic* or *Indo-Arabic numerals*.

The significance of the development of the positional number system is probably best described by the French mathematician Pierre Simon Laplace (1749-1827) who wrote:

It is India that gave us the ingenious method of expressing all numbers by the means of ten symbols, each symbol receiving a value of position, as well as an absolute value, a profound and important idea which appears so simple to us now that we ignore its true merit, but its very simplicity, the great ease which it has lent to all computations, puts our arithmetic in the first rank of useful inventions, and we shall appreciate the grandeur of this achievement when we remember that it escaped the genius of Archimedes and Appollonius, two of the greatest minds produced by antiquity.

Brahmi			—	=	+	μ	Q	7	5	2
Hindu	0	१	२	ભ	४	५	υy	७	٢	९
Arabic	•	١	۲	٣	٤	0	٦	٧	٨	٩
Medieval	0	Ι	2	3	8	ç	6	Λ	8	9
Modern	0	1	2	3	4	5	6	7	8	9

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