



ANCIENT NUMERICAL CODE

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ABSTRACT

A large material on Mathematics is available, if we look into the literature of Ancient India. Aryabhatteyam of Aryabhata-I and Siddhanta Siromani of Bhaskara are a few of such. The applications of the then mathematics are also being seen now in various fields. Most of the people don't know about this information because of this entire information is under the blanket of Sanskrit. To enable and to motivate the young researchers, we are describing "Ancient Numerical Code" and its applications in this article.

Keywords: Sanskrit Alphabets, little bit knowledge of Sanskrit.

Introduction

In ancient India all sort of mathematical data have been presented in the form of slokas with poetic style while on preparation of these slokas whenever there is a need to place huge numerals (numbers) the Mathematicians and Astronomers used the following number systems.

1. Katapayadi system
2. Aryabhateeya system
3. Bhoota Sankya System

The application of these systems is unique throughout Ancient India.

Rule of writing numbers:

अङ्कानां वामतो गतिः

i.e. the digits denoted by Sanskrit alphabets are to be written from right to left while reading.

Katapayadi system

This system is defined as follows:

कादि नव, टादि नव, पादि पञ्चक, याद्यष्टक, क्षः शून्यम्

The same is tabulated as follows

1	2	3	4	5	6	7	8	9	0
क	ख	ग	घ	ङ	च	छ	ज	झ	ञ
ट	ठ	ड	ढ	ण	त	थ	द	ध	न
प	फ	ब	भ	म					
य	र	ल	व	श	ष	स	ह		क्ष

Sanskrit alphabets and their assigned numerical values

Table - 1

**Note :**

1. All the vowel combinations of a consonant and itself have the same value
2. When a compound word comes, the consonant that comes at last in its pronunciation will be assigned the value.

Example: 1

$$\begin{aligned}
 \text{राम} &= \text{रा} + \text{म} \\
 &= \textcircled{2} \quad \textcircled{1} \\
 &= \text{म} \quad \text{रा} \\
 &= 5 \quad 2
 \end{aligned}$$

Example: 2

$$\begin{aligned}
 \text{पन्मुखः} &= \text{प} + \text{ण्मु} (\text{ण्} + \text{म्} + \text{उ}) + \text{ख} \\
 &= \textcircled{3} \quad \textcircled{2} \quad \textcircled{1} \\
 &\quad \text{ख} \quad \text{म} \quad \text{प} \\
 &\quad 2 \quad 5 \quad 6
 \end{aligned}$$

Example: 3

Jagadguru Bharati Krishna Tirthaji recorded the value of _ upto 32 digits in following sloka.

गोपी भाग्य मधुव्रात शृङ्गिशो दधिसन्धिग।
खलजीवीत खाताव गलहालारसंधर।।

The letters in the above sloka, the consonants to be taken and their values are as given below:



Letter in the sloka	consonant to be taken	value
गो	ग	3
पी	प	1
भा	भ	4
ग्य	य	1
म	म	5
धु	ध	9
वा	र	2
त	त	6
शृ	स	5
ङ्गि	ग	3
शो	श	5
द	द	8
धि	ध	9
स	स	7
न्धि	ध	9
ग	ग	3
ल	ल	3
जि	ज	8
वी	व	4
च	च	6
खा	ख	2



ता	त	6
व	व	4
ग	ग	3
त	त	3
हा	ह	8
ला	ल	3
र	र	2
सं	स	7
धा	ध	9
र	र	2

Therefore $\pi = 3.1415926535897932384626433832792$

This system is commonly used by Kerala Astronomers and Mathematicians in South India.

1.4 There is another number system used by Aryabhata in his Aryabhateeyam called Aryabhata number system. This is slightly different from Katapayadi system. In this system 25 devanagari Alphabets i.e. from ka to ma called varga letters represent the numbers 1 to 25 as shown below.

1	2	3	4	5	6	7	8	9	10
क	ख	ग	घ	ङ	च	छ	ज	झ	ञ
11	12	13	14	15	16	17	18	19	20
ट	ठ	ड	ढ	ण	त	थ	द	ध	न
21	22	23	24	25					
प	फ	ब	भ	म					

Varga letters and their assigned values



Table - 2

The remaining 8 letters i.e. from ya to ha called avarga letters are assigned the numbers as follows

30	40	50	60	70	80	90	100
य	र	ल	व	श	ष	स	ह

A Varga letters and their assigned values

Table – 3

In the katapayadi system a vowel has no value at all where as in the Aryabhateeya system each vowel will have two types of values – Even powers of ten for varga letters and odd powers of ten for avarga letters. It is shown as follows:

अ इ उ ऋ ए ओ लृ ऐ औ

Values when combine with varga letters. $10^0 10^2 10^4 10^6 10^8 10^{10} 10^{12} 10^{14} 10^{16}$

Values when combine with Avarga letters $10^1 10^3 10^5 10^7 10^9 10^{11} 10^{13} 10^{15} 10^{17}$

Note:

In writing numbers the places also should be classified as varga and avarga in sense of squares and non squares.

For example, let us see the value indicated by ख्युघृ

ख = 2

य = 3

उ = 10000

उ = 100000

खु = 2 * 10000 = 20000

यु = 3 * 100000 = 300000

घ = 4

ऋ = 1000000

घृ = 4000000

Therefore total value of ख्युघृ = 4000000 + 300000 + 20000

= 43,20,000

1.5 Bhoota sankya system

It is commonly used number system in most of the ancient texts. Pingalacharya's Chandas Sastra is the very first text used this system.

In this system, the numerals are expressed by the objects traditionally associated with some numbers.



शशी सोमश्शशाङ्कश्च इन्दुश्चन्द्रः कलानिधिः।
 राजा विथुस्सुधांशुश्च यम एकजनस्तथा॥
 अक्षि चक्षुः करो नेत्रं लोचनं बाहुकर्णकाः।
 पक्ष दृष्टि द्वयं युग्ममंबकौ नयनेक्षणे॥
 बह्नी रामशिश्वी चाग्निः पावको दहनानलौ।
 शंकराक्षिपुरीलोकास्त्रीणि कालस्त्रयोगुणः॥
 अब्धि सागर चत्वारि वनराशिर्युगोंबुधिः।
 चतुर्वाधिं गतिश्चापि जलधिर्नीरधिस्तथा॥
 इन्द्रियं पञ्चमं ज्ञानमिषुर्बाणश्च मार्गणः।
 व्रतं भूतं शरः पर्वा प्राणश्च विषयस्तथा॥
 शास्त्रं षट्च रुचिश्चैव कालश्च ऋतुसंज्ञिकं।
 रसद्रव्यं च कोशश्च षड्दर्शनषडागमौ॥
 शैलोर्द्विर्द्वीपपायुश्च मुनिस्सप्ताचलो गिरिः।
 तुरगाश्चनगो गोत्रमहीध्र ऋषिसंज्ञिकाः॥
 अष्टमं गजकर्णी च दिग्गजो दन्ति हस्ति च।
 सामजो मत्तमातंगः दिक्पालवसुवारणाः॥
 नवमं नवरत्नं च ब्रह्मा च कमलासनः।
 निधिर्ग्रहश्च खण्डं च रन्ध्रो भावश्च लब्धकः॥
 आकाशं गगनं शून्यमन्तरिक्षं मरुत्पथम्।



Meaning of Sloka

❖ चन्द्र, इन्दु, हिमकर, शशि, सोम, कळानिधि, राज, सुधांसु,	1
❖ नेत्राणि, बाहू, कर्णानि, पक्षे,	2
❖ अग्नि, राम, त्रिलोचनानि, त्रिपुराणि, (त्रयः)लोकाः, कालाः, गुणाः,	3
❖ वेदाः, युगाः, सागर,	4
❖ पञ्चभूत, बाण, पर्व, इन्द्रियाणि,	5
❖ शास्त्र, रस, ऋतु, दर्शन, आगम	6
❖ ऋषि, पर्वत, द्वीप	7
❖ मातङ्ग, वसवः, दिक्पालकाः	8
❖ ग्रह, रत्न, निधि, प्रजापति, रन्ध्र	9
❖ अवतार	10
❖ आकाश	0

Conclusion

Even today these systems have wide applications in the field of computer science, linguistics and various code languages that are being used for confidential matters. Hence these three systems should be brought for awareness among young researchers.