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Journey into the Realm of Mathematics and Language

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Abstract

Language is organic, innate and ubiquitous. It is the skill that connects everything. Humans try to explore and express themselves through language. The nature and components of language have been humans' preoccupation for a long time. As a corollary, mathematics is also a medium through which humans try to make sense of their world and also express themselves. Humans have remained fascinated by the shapes in nature, and they constantly try to explore and express the world in mathematics. I think that both language and mathematics are inherent behaviors that humans possess and exhibit.

As I tried to learn mathematics, I was inevitably struck by the features that overlap and run parallel in both the subjects – mathematics and language. This paper is more about my little understanding of both the subjects.

Keywords: inherent behaviours, mathematics, language, components of mathematics, features of language, comparison of mathematics and language.

Introduction

Mathematics is everywhere in nature and so are sounds. Human beings have always tried to define and describe nature in its all complexities and using mathematics and these two realms always have overlapped by giving deeper understanding of the nature of world around us.

A large and undeniable part of the world that we are surrounded by is also made oof sound. These sounds can be the babbling of a brook, to the roar of a waterfall, to the chirping of birds or the attempt by human beings to produce and arrange sounds in the form of speech and music.

The more man evolved and tried imitate nature he became aware of the overwhelming presence of mathematics in every filed.

Coming to the field of mathematics – the encyclopedia of mathematics tries to draw a continuum between mathematics and language - "The theory of formal grammars occupies a central position in mathematical linguistic because it allows one to simulate the most essential aspects of the function of language — the processing of meaning into text and conversely — and because of this it serves as a connecting link between the remaining divisions of mathematical linguistics." However, there is a dearth of literature that tries to draw and understand the field of number theory and phonetics, the rules and laws that govern them correspond and contrast in wonderfully interesting ways. I am exploring both in my limited knowledge and experience.

Sounds of Sanskrit

In the seminal text ***Ashtaadhayayi*** of Panini, Panini begins the text with the salutations to the "supreme spirit". In ***Ashtaadhayayi***, Panini has organized the sounds of Sanskrit -- there are fourteen verses for the recitation of the Sanskrit alphabet (47 letters: 14 vowels and 33 consonants). It is known as the *Akshara-samamnaya*, "recitation of phonemes". The Sanskrit alphabet sequence of *akshara* is also known as *Varna-mala*, "garland". The word *varna* means a "syllable" and all the energies related to that syllable — colour, presiding force, the mouth part used to pronounce each syllable, the related body part, etc. Each of the fourteen verses consists of a group of basic Sanskrit phonemes.

1. a i u Ṇ	१. अ इ उ ण् ।ൣ
2. ṛ ḷ K	२. ऋ ऌ क् ।ൡ
3. e o Ṅ	३. ए ओ ङ् ।ൾ
4. ai au C	४. ऐ औ च् ।ൿ
5. h y v r Ṭ	५. ह य व र ट् ।ඁ
6. l Ṇ	६. ल ण् ।ൽ
7. ñ m ṁ ṇ n M	७. ञ म ङ ण न म् ।ം
8. jh bh Ñ	८. झ भ ञ् ।ഇ
9. gh ḍh dh Ṣ	९. घ ढ ध ष् ।ഘ
10. j b g ḍ d Ś	१०. ज ब ग ड द श् ।ച
11. kh ph ch ṭh th ca ṭ t V	११. ख फ छ ठ थ च ट त व् ।ഠ
12. k p Y	१२. क प य् ।ഡ
13. ś ṣ s R	१३. श ष स र् ।ണ
14. h L	१४. ह ल् ।ഽ

Modern phoneticians, in the I.P.A. list 87 symbols of different sounds like including consonants and vowels. The sounds are also mapped according the nature, marked by diacritic symbols.

If one looks at the sounds in I.P.A chart, one becomes aware that human beings are capable of producing only a certain limited amount of sounds due to the constrains of evolution. However, the ingenuity of man is such that he is capable of creating infinite combinations of sounds, with meaning and some without meaning.

In Mathematics

Keeping this in view, if one looks at the number theory in mathematics, especially infinite series, one can draw a corollary to this important concept.

An infinite sequence is an **endless progression of discrete objects**, especially numbers. A sequence has a clear starting point and is written in a definite order. An infinite sequence may include all the numbers of a particular set, such as all positive integers {1, 2, 3, 4 …}. Infinite series tells us that a sum of series does not have a limit.

Mathematicians have tried to understand and express the infinite series as

$\{a_1, a_2, a_3, \ldots a_n, a_{(n+1)}, \ldots\}$

In this case, $\{a_1\}$ would be called the first term, $\{a_2\}$ would be called the second term, and so on. The variable *n* could be any number. The ellipsis {…} indicates no end or limit. Using such terminology one expresses a notation for infinity – even if humans do not have a full understanding.

Two types of infinite sequence deserve attention here. An arithmetic infinite sequence is a progression of numbers where the difference between each consecutive term is constant. The interval between the terms is called the "common difference." For instance, an arithmetic infinite sequence starting with 2 with a common difference of 2 would look like this:

{2, 4, 6, 8, 10 …}

Sounds and Numbers

Just as we have an infinite series, we can have ***n*** number of combinations of sounds. Some of these have been ascribed meaning by different cultures. Some are so difficult to articulate that it is only on paper we see such an articulation.

When sounds converge, they form a phoneme. However, to understand the language, these sounds must be converted into discrete linguistic units such as phoneme/ morphemes just like the infinite series $^1/_2$ $^1/_4$ $^1/_8$……..$^1/_{32.}$ All tend to 1, the complete whole real number that is tangible.

As a corollary, if we try to apply the divergent rule for phonetics where the rule says that 1+2+3+4+ _ _ _ _ _.

If we keep creating converging phones, we can make any number of phones but the phones becoming phonemes is dependent on the culture and the human ability to apply/ create meaning to words. And this capacity is what means us to be humans, or it becomes the distinguishing character of our species.

In conclusion, I would like to explore in depth the nature and interpretation connections between mathematics and long-phonemes of language. This also is likely to offer us a better understanding between mathematics and language.

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