

Phonological and Morphological Elements of the Cardinal and Ordinal Numerical System of Kenyan Sign Language (KSL)

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Abstract

This paper is an attempt at a comprehensive discussion of the cardinal and ordinal numerical system of Kenyan Sign Language (KSL). Numerals are a feature of all languages. The numerical system of KSL has not been examined structurally. This paper therefore examines the different strategies used to generate both cardinal and ordinal numbers in KSL. All languages have a system or a way that they use that enables users to associate things or objects with quantity. This enables them assign importance to certain things in real life by assigning them numerical value. In KSL certain signs are used to represent numbers, thus culminatively forming the KSL numerical system that is used to show quantity or define a set of values. The paper examines the (articulatory properties) or phonological elements of both cardinal and ordinal numbers in KSL. The paper also discusses KSL morphological elements in its numerical system. Numerals in KSL especially the cardinal numbers can be articulated using one hand that represents distinct morphemes as exemplified by signs for numbers (1-5) or through the use of two hands – both active and passive articulators giving us compound signs e.g. signs for numbers 6-10. Ordinal numbers on the other hand are articulated only on one hand.

Key words: *numerals, cardinal, ordinal, morphological, phonological*

1.1 Introduction

Like any natural sign language, Kenyan Sign Language (KSL) possesses signs for numbers. This paper is a linguistic description and analyses of the structure of numbers in KSL both at the phonological and morphological levels. Numbers are described in linguistics according to purpose. This paper is an examination of both cardinal and ordinal numbers in KSL.

Cardinal numbers

Cardinal and ordinal numbers belong to the semantic field of numbers. A semantic field constitutes a group of words that are related conceptually or through similar meaning and which refer to a specific subject. Numbers just like animals, family etc represent specific semantic fields. Cardinal numbers are those numbers in a language that are used mostly for counting. They normally start from 1 and sequentially continue up to infinity. These numbers are used to show the quantity of something. Cardinal numbers in English for example can be indicated in Multiples of 10 (1-10), multiples of 100 (100- 1000), multiples of 1000 (1000-900,000), etc. cardinal numbers are said to answer the question “how many?”

Ordinal Numbers

Ordinal numbers on the other hand, are those numbers in a language used to indicate the precise location of something or someone somewhere or at a place. They can be used as ranking words showing the rank or the position of something appearing in a succession. For example a number of objects or persons can appear in a list if this happens, ordinal numbers are used to define their position in that list. Ordinal numbers can also be viewed as adjectives, nouns or pronouns that are used to denote the order of something or someone in a list such as 1st – First, 2nd –Second, 3rd –Third, 4th –Fourth, 5th –Fifth, etc. The ordinal numbers are ordinarily sequenced contingent on

parameters, such as size, weight, marks, etc. ordinal numbers answer the question “where?” or “which?”

1.2 Theory

Human beings through the use of language put things in the real world into different categories. In this way then they are able to understand them. Since we live in a complex world, categorization enables us to simplify our environment and provide a guide for action. According to Allport (1954, p.174), categories are “nouns that cut slices” through our environment. Objects and people for example are categorized into groups (cognitive process). In this case then language is used to construe human experience by putting things for example in different semantic domains such as family, animals, numbers etc. These various elements of the world are organized into categories during the socialization process. Users of KSL categorize their world through language into different semantic domains. The concern of this paper is the number domain in KSL. We shall take a functional approach in this analysis which works on the assumption that language is shaped by functional pressure for effective communication; thus language is used to communicate precisely while using minimal cognitive resources. Functional grammar is used to explain based on a communicative situation.

There exists several linguistic theories within functional grammars. For this paper, however, we shall use tenets of Systemic Functional Grammar – Halliday (1964). Halliday views language as a system of social semiotics, a branch of semiotics that views meaning making as socially construed. In KSL the meaning of numerals are socially construed to perform certain functions. For example, in order to understand numbers, we need to take into consideration the functions they carry out. According to Goldin-Meadow et al (2003) "It's not just the vocabulary words that matter, but understanding the relationships that underlie the words--the fact that 'eight' is one

more than 'seven' and one less than 'nine','. The function that numbers play in language especially in thinking is very well summarized by Richard Dedekind as quoted in Weise (2003)

Of all the devices the human mind has created to make its life – that is, the task of reasoning - easier, there is none that has such a great effect and is so indivisibly connected to its innermost nature, as the concept of number. [...] Every thinking human, even if he does not feel it clearly, is a numerical being [...]

Halliday (1964), talks about the "organization of the functional framework around systems", i.e., choices or metafunctions. Hodge (2017) summarizes Halliday's views on social semiotics as follows:

1. 'Language is a social fact.'
2. 'We shall not come to understand the nature of language if we pursue only the kinds of question about language that are formulated by linguists.'
3. 'Language is as it is because of the functions it has evolved to serve in people's lives.'
4. Language has 'metafunctions', which are: ideational ('about something'), interpersonal ('doing something') and textual ('the speaker's text-forming potential').
5. Language is constituted as 'a discrete network of options.'

Based on the above, this paper tries to understand the nature of KSL in terms of its number systems. We argue that the KSL number system has evolved to serve its users to cater for the need for efficient communication. Through the ideation metafunction, which is based on the general assumption that language has the basic function of communicating information, we posit following Schleppegrell, (2013), that languages, KSL included, are used to name things by characterizing them into categories. Languages then further expound these categories into

taxonomies using more names for doing so. KSL has signs that are used to name the category of number and these signs are the concern of this paper.

Halliday & Matthiessen, (2004) discuss a compositional structure which they call the constituency. In this constituency, they assert that larger units of language comprise smaller ones. The constituency has the following principles:

- i) Every grammar of a language has a scale of rank that is represented in the form of a clause, a group, a word and a morpheme.
- ii) Every rank has one or more units ensuing from the rank next below it.
- iii) Each rank's units may form different types of complexes such as clause complexes, group complexes and word complexes.

Halliday as quoted in Maina (2020) explains the complexity of human language under the following five principles:

- Paradigmatic dimension: This dimension operates on the assumption that meaning is choice and that language users pick from available options within their environment and that language is a huge network of interrelated choices.
- Stratification dimension: Views language as an abstract network of interrelations. And that language has an "organizational space" that makes it an infinite meaning-making system.
- Metafunctional dimension. Language evolved due to the need for humans to make meanings about the world they live in and also be able to create and maintain interpersonal relations.

All languages according to Halliday therefore contain three simultaneously generated metafunctions:

- i) Ideational
 - ii) Interpersonal and;
 - iii) textual
- Syntagmatic dimension. This function is mainly about how words or signs are ordered and positioned. It concerns units on different ranks within each layer of the language system. Within the level of the vocabulary and syntax, for example, the largest unit is the clause, while the smallest one is the morpheme; in-between these ranks we have the ranks of group/phrase and of words.
 - Instantiation dimension. This dimension deals with “the relation between an instance and the system that lies behind it”. Instantiation is a conventional relationship between potential and actual.

We shall use the tenets of this theory that are relevant to our discussion in the attempt to explain the KSL numerical system.

1.3 Methodology

This is a qualitative research aimed at trying to understand how humans behave and the reasons underlying their behaviour. One such human behaviour is categorization. This research is a descriptive analysis of the category of number in KSL with specific reference to the cardinal and ordinal numbers. We analyze the different realizations of both cardinal and ordinal numbers.

Data for this research was collected based on observation of native users of KSL while teaching numbers in KSL. The researcher was a non participant observer and the researcher’s intuitive knowledge of the language as a near native user of KSL (Introspective evidence) was useful in

generating and verifying more data and in inferring important linguistic structures of numbers in KSL.

Data analysis

Our intuitive data upon which the analysis of this paper is based consisted of:

1. The structural features both phonological and morphological that distinguish cardinal from ordinal numbers in KSL.
2. The different realizations of both cardinal and ordinal numbers.

1.4 Cardinal numbers in KSL

Cardinal numbers in KSL from 0-5 are signed using one hand. However, from number 6 onwards, the numbers are signed using two hands giving us a morphologically complex signs. Similarly, for multiples of hundreds i.e. 100 up to 500; multiples of 1,000 up to 5,000; 20,000-50,000 the first 5,000 are signed using one hand thereafter, from 100,000- 500,000 and from 1,000, 000 to five million are all signed using one hand. Likewise, multiples of 1,000-5,000 are signed using one hand so are 20, 000,000-25,000,000; 30,000,000-35,000,000 in that order. Using the Halliday's stratification dimension, KSL through its numerical system provides an abstract network of interrelations as demonstrated above used in making meaning in counting or to show the quantity of something for cardinal numbers. For ordinal numbers they are used as ranking words which show the rank of the position of something appearing in a series. The Syntagmatic dimension on the other hand shows how the signs in each category from the 10s to million, or trillion are ordered and positioned. This ordering of the signs includes units of different ranks within the stratum of the numeral system.



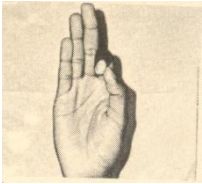
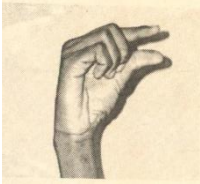

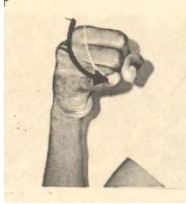



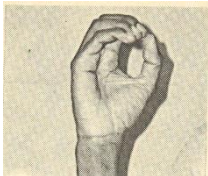


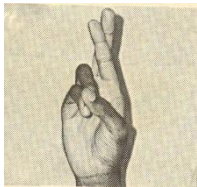


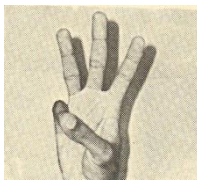

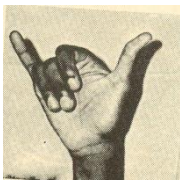
Following Halliday & Matthiessen, (2004) compositional structure known as a constituency, the above discussion show that larger units of KSL numerals comprise smaller ones. Thus numerals from 6 onwards espouse this principal. Numeral six is a compound of number 5 and 1; 7 is a compound of 5 and 2; 8 is a compound of 5 and 3; 9 is a compound of 5 and 4 etc. According to the constituency principal, KSL grammar at the numeral level therefore has a scale of rank at the sign or morpheme level. And as demonstrated above, each rank has one or more units emanating from the rank next below it apart from the basic numerals 1-5. For most numbers the ranking is maintained at the level of multiple of 5s. For the tens, the principal of ranks containing one or more units from the rank next below it is well illustrated. From Numeral 11 to 19 they are signed TEN^ONE; TEN^TWO; TEN^THREE; TEN^FOUR; TEN^FIVE; TEN^SIX; TEN^SEVEN; TEN^EIGHT and TEN^NINE respectively. The same is true form 20 -29. 30-39... up to 99. The same pattern is followed for numbers from 100 onwards.

1.4.1 Phonological and morphological elements of Cardinal numbers

The term phonology in sign language studies according to Okombo et.al. (2006) studies the physical properties of signs whose contrasts can cause meaningful differences among signs. In KSL, the following parameters act as the main distinguishing physical properties: Hand shapes or hand forms (articulators), movement or motion (manner of articulation), location (place of articulation), and palm orientation (manner of articulation).

Hand shape and palm orientation (1-5)

Most hand shapes or hand forms in KSL are driven from the letters of the one-handed manual alphabet used by persons who are deaf in Kenya as illustrated in the table below:

 <p>A</p>	 <p>B</p>	 <p>C</p>	 <p>D</p>	 <p>E</p>
 <p>F</p>	 <p>G</p>	 <p>H</p>	 <p>I</p>	 <p>J</p>
 <p>K</p>	 <p>L</p>	 <p>M</p>	 <p>N</p>	 <p>O</p>
 <p>P</p>	 <p>Q</p>	 <p>R</p>	 <p>S</p>	 <p>T</p>
 <p>U</p>	 <p>V</p>	 <p>W</p>	 <p>X</p>	 <p>Y</p>

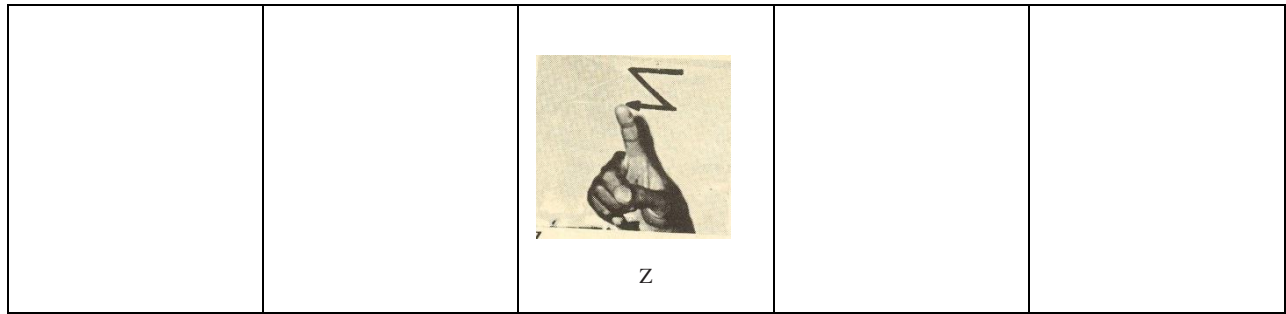


Fig .1

In the articulation of the numbers 1- 5 the hand shapes used are one handed and though in KSL orientation has been known to change the meaning of signs, here the orientation of the hand shape does not have any significance and does not affect the meaning of the number. (See fig. 4 below)

1.4.2 Cardinal numbers in KSL (0-5)







SIGN						
NUMBER	0	1	2	3	4	5

Fig. 2

Movement and location

ZERO is used to represent nothing- no amount or no object. Zero together with numbers such as 1,2,3,4, etc are considered part of natural or whole numbers sets. ZERO is signed using the hand form that can be described as thumb touching fingertips, the hand form moves from besides the signer’s body to a neutral position (zero location) in front of the signer where it is produced or its location. ONE is articulated using the index-finger hand form with an upwards thrust movement

and its location is the same as ZERO. TWO is signed using the V- hand form same movement as ZERO but in its production, there is an upwards thrust but its location or place of articulation is same as ZERO and ONE. THREE has two variants. It can be articulated using the fist hand form with upwards thrust to produce the F- hand form (as exemplified Fig. 2 above) or the W- hand form (Fig. 3 below) both of which are acceptable. It still maintains the same movement and location as the numbers before it.

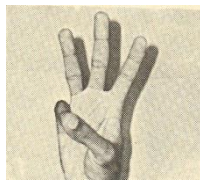


Fig. 3 THREE

FOUR is signed using the fist hand form with upwards thrust to produce the B- hand form with fingers spread while FIVE is signed using the fist- hand form with no upwards thrust but still maintains the same movement and location as the others. As indicated earlier the palm orientation of these signs does not affect its meaning. Thus the numerals from 1-5 can be signed facing the listener or the signer and it would not make any difference as exemplified below:


Number	Sign
1	

Fig. 4

The signs from 0-5 are all monomorphemic signs since they are made up of single morphemes in KSL. However, in the articulation of these numbers as far as direction is concerned it is all upwards.

1.4.3 Phonological and morphological elements of Cardinal numbers from 6-10

KSL numerals become morphologically complex from number 6 – 10 since they are now using double hand articulation and thus producing compound signs. Morphology is concerned with the minimal components of words/signs that have meaning and cannot be broken down further – morphemes. In signed languages, a segment of a sign visually presented that constitutes one morpheme is a morph. A visual – manual morpheme is the smallest meaningful unit in Sign Language. Numerals in KSL can be articulated using one hand that represent distinct morphemes as exemplified above (1-5) above or through the use of two hands – both active and passive articulators giving us compound signs. Compounding is a process that takes place when two distinct morphemes or signs are combined to produce a single word or sign.

In KSL, compound signs are formed when two or more completely distinct signs are brought together to form a new sign. This according to Spence and Woll (1999) produces ‘polymorphemic’ signs which are signs that have more than one morpheme or bound morphemes in KSL since they have to combine with other morphemes to make meaning. Morphemes are used in the creation of new signs. These current signs can be formed by addition of a derivational affixes to a base. In the production of numbers 6- 10, derivational affixes are used to create new numbers from a root signs thus occasioning change of the number categories. If we view a prefix as any word, letter, or number placed before another, we can identify as prefixation the process of deriving number 6 – 10. The sign FIVE is the base sign thus acts as the prefix to which numbers 1-5 are added. As illustrated below:


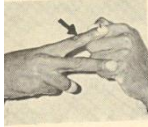



NUMBER	SIGN	COMPOUND
6		A compound of number 5 and 1
7		A compound of number 5 and 2
8		A compound of number 5 and 3
9		A compound of number 5 and 4
10		A compound of number 5 and 5

Fig. 5

Number 6 is a compound of number 5 and 1. The sign for FIVE being the passive articulator (or the prefix) while the hand form for 1 is the active one. Number 7 is a compound of 5 and 2; the sign for FIVE being the passive articulators (or the prefix) while the hand form for 2 is the active one. Number 8 is a compound of 5 and 3; the sign for FIVE being the passive articulators (or the prefix) while the hand form for 3 is the active one. 9 is a compound of 5 and 4; the sign for FIVE being the passive articulators (or the prefix) while the hand form for 4 is the active one. While 10 is a compound of 5 and 5. Both hand forms articulating the two FIVES are active. Being a sign that uses both hands, the two hand forms move independently during its production and both hands are specified for the same location, the same hand shape, and the same movement performed simultaneously according to the Symmetry Condition by Battison (1978) as explained below.

From the analysis of numbers 6- 10 above, the principle of constituency, as expounded by Halliday & Matthiessen (2004), clearly shows that KSL has a scale of rank that manifest itself in

signs (morphemes) and each rank contains one or more units that emanates from the rank next below it and also each rank may form complexes (from numeral 6 and above) which have a complex morphology since they are compound signs as compared to (0-5).

In the articulation of these compound numbers (from 6-10), they take the structure FIVE^ONE; FIVE^TWO; FIVE^THREE; FIVE^FOUR and FIVE^FIVE.

The use of two hands in signing numerals performs crucial formational components in the structure of signs. Battison (1978) indicates that “signs that use two hands and share the same phonological aspects are the most redundant and therefore the least complex for example those that have the same hand shape, movement, and location. However, signs that use two hands in their production and do not share all phonological aspects are more complex. He identified two conditions of Complexity in two-handed signs (33–34).

1) The Symmetry Condition

This is manifested when both hands in a two handed sign progress independently during its production, or when both hands must be specified for the same location, the same hand shape, and the same movement (whether performed simultaneously or alternately). For example in the production of the number 10 as illustrated below:



Fig. 6 TEN

2) The Dominance Condition

This condition is exhibited when the hands of a two-handed sign are not the same in terms of specification for hand shape in which case then one hand must be passive while the active hand articulates the movement, and in KSL, the specification of the passive hand shape is restricted to

the S hand form used in the production of letter 5 for example in the production of the number 6-10 as illustrated in fig. 5 above. The signing of the two handed numerals in KSL discussed above, conform to the dominance condition since their production is normally different and they do not share the same specification for hand form.

This can be further illustrated by the numeral SIX in KSL which is articulated using the S- hand form for FIVE followed by the index figure hand form for numeral ONE. The two hand forms used in the production of numeral SIX use different hand forms. FIVE (S- hand form) and ONE (index finger hand form) as shown below:

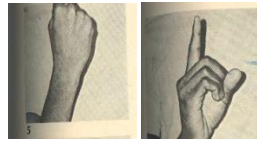


Fig. 7

FIVE ^ ONE

In signing six, the hand form for production of FIVE (S- hand form) is the passive hand form while the hand form for production of ONE (index finger hand form) is the active hand from that articulates the movement as shown below:



Fig. 8 SIX

In signing SEVEN, we use FIVE (S- hand form) and TWO (V- hand form), the hand form for production of FIVE (S- hand form) is the passive hand form while, the hand form for production of TWO (V- hand form) is the active hand from that articulates the movement as shown below



Fig.9

FIVE ^ TWO = SEVEN

In signing EIGHT, we use FIVE (S- hand form) and THREE (F or W- hand form), the hand form for production of FIVE (S-hand form) is the passive hand form while, the hand form for production of THREE (F or W hand form) is the active hand from that articulates the movement as shown below:

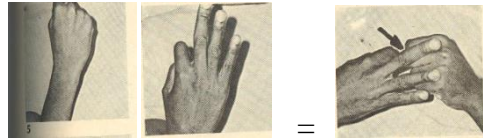


Fig. 10 FIVE^THREE = EIGHT

In signing NINE, we use FIVE (S- hand form) and FOUR (B- hand form).The hand form for production of FIVE (S- hand from) is the passive hand form while the hand form for production of FOUR is the active hand from that articulates the movement as shown below:



Fig. 11 FIVE^ FOUR = NINE

In signing TEN, the two hands must be specified for the same location, the same hand shape, and the same movement there is no discernable passive articulator as movement is performed simultaneously – FIVE (S- hand form) and FIVE (S- hand form) that articulates the movement as shown below:



Fig. 12 FIVE^ FIVE = TEN

Numerals in KSL are ranked in scales that manifest themselves in signs (morphemes). Each rank in this scale is made up of one or more units that arise from the rank next below it. This is true of

numerals SIX – NINE. SIX is signed FIVE^ ONE; SEVEN is signed FIVE^TWO; EIGHT is signed FIVE^THREE and NINE is signed FIVE^ FOUR. ONE, TWO, THREE and FOUR are all a rank below FIVE. For TEN however, the two articulators are of the same rank that is FIVE^FIVE. Similarly, each rank from numeral 6 and above form word complexes since they exhibit complex morphology that produces compound signs in KSL.

Numerals from 11-19

Numbers 11 – 19 just like numerals 6-10 also use compound structures as demonstrated below:

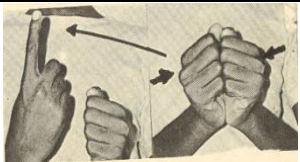




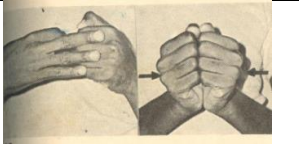



NUMBER	SIGN	NUMBER	SIGN
11		16	
12		17	
13		18	
14		19	
15			

Fig.13

The numerals from 11- 19 are also bound morphemes or ‘polymorphemic’ signs in KSL. In their production, they take the structures illustrated below:

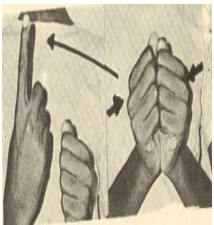
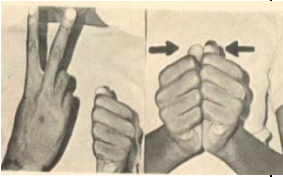


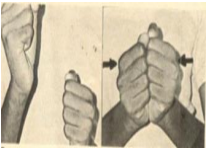
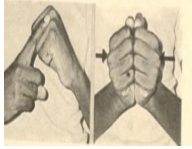

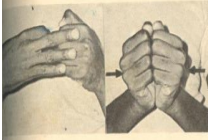

SIGN	STRUCTURE	SIGN	STRUCTURE	SIGN	STRUCTURE
	TEN^ONE		TEN^TWO		TEN^THREE
	TEN^FOUR		TEN^FIVE		TEN^SIX
	TEN^SEVEN		TEN^EIGHT		TEN^NINE

Fig.13

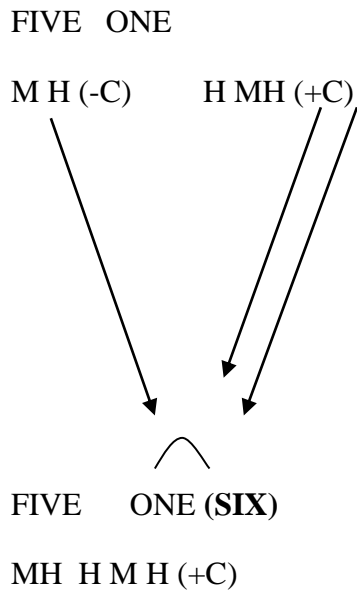
In KSL the numerals from 11-19 are Morphologically complex signs since they are composed of more than one morpheme that is they are bound morphemes or polymorphemic signs according to Spence and Woll (1999). Aronoff (2003), et al on the other hand assert that SL morphology can be classified either as sequential or simultaneous. Sequential morphology on one hand deals with signs that are comprised of two free morphemes or a bound morpheme and a free morpheme –i.e. polymorphemic signs. It also relies on the creation of new units in language and it is therefore derivational. On the other hand, Simultaneous morphology does not create new units but adds grammatical information to already existing units. Information that can be on number, tense, agreement or case etc. it is therefore inflectional. Numbers 6-10; 11- 19 in KSL are formed through the process of compounding where two distinct signs are brought together to

form a new sign. In numerical formation however, it does not involve bringing together elements from different lexical categories but the distinct signs being brought together are of the same lexical category of number. For example, numbers five to nine involve the amalgamation of FIVE and ONE- FIVE as shown below in production of SIX:



Fig.14 FIVE^ ONE = SIX

The compound sign SIX takes the following structure following the movement- hold model as proposed by Liddell and Johnson (1989) based on the claim that signs consist of hold segments and movement segments produced sequentially. They describe holds as “periods of time during which all aspects of the articulation bundle are in a steady state.” Movement on the other hand is defined as “a period of time during which some aspects of the articulation is in transition.” SIX is represented by the following movement- hold structure:



The rest of the numerals 7-9 also take the same structure as above where FIVE made from the S- hand form is the passive articulator and acts as a prefix moves to a hold position in the zero location before the

active hand forms made from different hand shapes move to come into contact with the FIVE as illustrated above. For number SIX, the index finger hand form for ONE is the active articulator. The same pattern is repeated for SEVEN where the sign for FIVE is still the passive articulator while the V- hand shape for TWO is the active one. For EIGHT the sign for FIVE is passive and for sign THREE the W- hand form or the F- hand forms are active. Nine is signed with passive articulator sign for FIVE with the B- hand form with fingers apart as the active hand form.

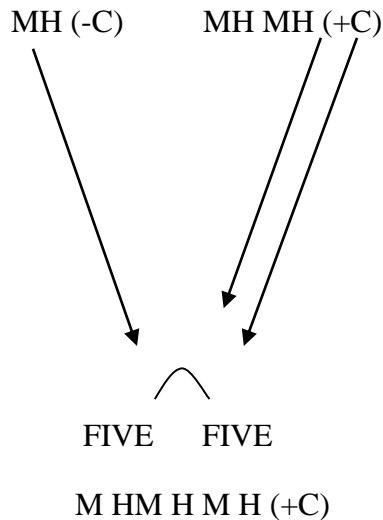
Numerals from 10- 19 on the other hand take a different structure:

TEN is a compound of FIVE and FIVE

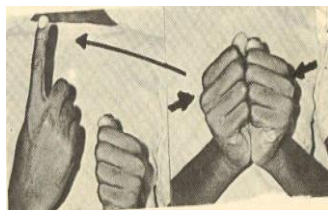


TEN is represented by the following movement- hold structure:

FIVE ^ FIVE = TEN



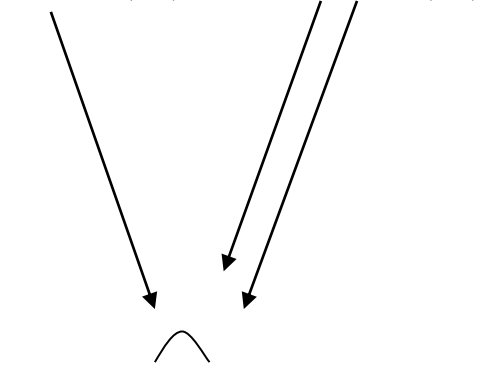
Number ELEVEN on the other hand is a compound of FIVE and FIVE (TEN) and ONE.



In signing SIXTEEN, the two S- hand forms facing each other (for TEN) are both passive at the initial stage but some movement is added to produce numeral TEN when they come together after that numeral SIX is produced using FIVE (S- hand form) passive articulator followed by the index-finger hand form for ONE that then moves to touch the S- hand form for FIVE to produce SIX to complete articulation of SIXTEEN. SIXTEEN has the following movement- hold structure:

FIVE FIVE (TEN) FIVE ONE (SIX)

MHMH (+C) MHMHHM (+C)



FIVE FIVE FIVE ONE

M H MHM (+C) MHMMH (+C)

During the signing of SIXTEEN, some holds are deleted. The hold for signing ONE before coming into contact with FIVE to give us SIXTEEN is deleted. Therefore, instead of having TEN^FIVE^ONE^ SIX we have TEN^FIVE^SIX. The change from: MH MH (+C) →MH MM H (+C) – One hold in the production of six is deleted. The same structure is repeated for 17-19 in which the hold that occurs in the production of SEVEN, EIGHT and NINE are also deleted.

The numeral TEN in the production of numerals 11-19 above is normally placed before the other numerals following in this way TEN acts as a prefix since it is the base upon which all the following numbers depend on to make meaning. In other words it is attached to several signs to make meaning.

It is also noteworthy that the Signs for 11-15 in KSL can be signed alternately by the use of individual digits resulting in what is called sequential compounding. For example numeral 11 can be signed by

repeating or reduplicating numeral ONE; 12 can be signed by numeral ONE followed by TWO; 13 numeral ONE and THREE; 14 numeral ONE and FOUR while 15 will be signed using numeral ONE and FIVE as exemplified below:

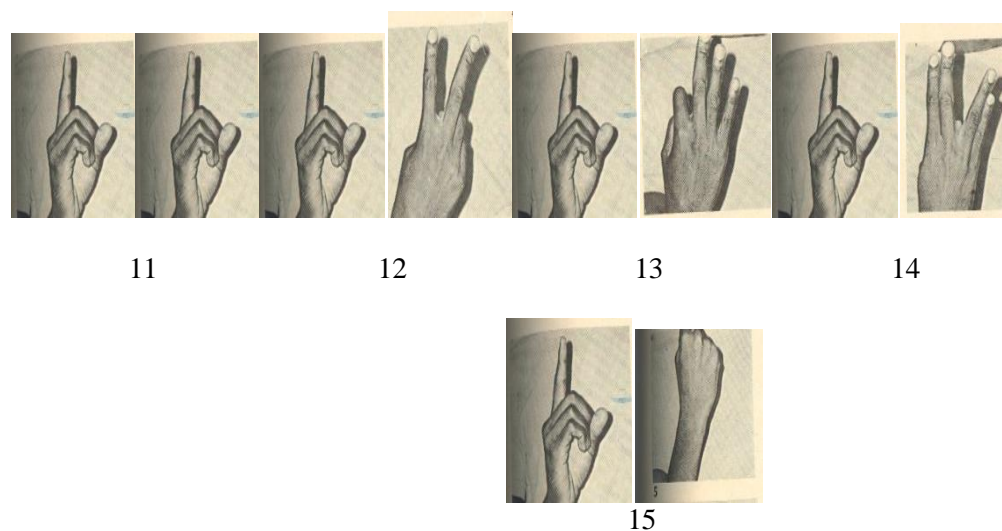


Fig.18

Though the hand shapes used in signing Numerals 11-15 as exemplified in fig 18 above are one handed, it does not make these signs monomorphemic signs. They remain polymorphemic signs because they are made up of more than one morpheme or they bound morphemes in KSL since they have to combine with other morphemes to make meaning. ONE is the common denominator in their production and therefore acts as a prefix. They take the following structure ONE^ ONE, ONE^TWO, ONE^THREE, ONE^FOUR and ONE^FIVE.

Numerals in multiple of tens that is form 20 -50 in KSL are morphologically simple but they are polymorphemic signs though they are signed using one hand, they are made up of more than one morpheme. They take the following compound structure 2^ 0; 3^0; 4^0 and 5^0 exemplified below:

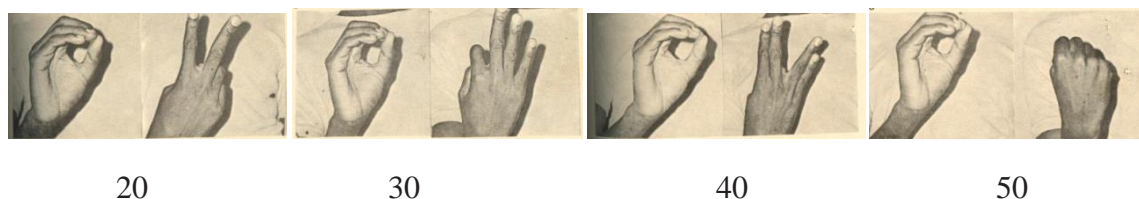


Fig.19

In the production of 20- 50, we note that ZERO is a common denominator and since it comes after a number, we can posit that it is used as a suffix.

However, from 60 – 90 KSL numerals become morphologically complex signs since they are produced using double articulation using both hands and have more than one morpheme (bound morphemes) or are polymorphemic sign since there has to be a combination of morphemes for them to be produced as exemplified below:



Fig.20

Sixty is a compound of six and zero and has the following compound structure SIX^ZERO.

Seventy is a compound of seven and zero and has the following compound structure

SEVEN^ZERO. Eighty is a compound of eight and zero and has the following compound

structure EIGHT^ZERO. Ninety is a compound of nine and zero and has the following

compound structure NINE^ZERO.

Numerals from 100 –

The numeral 100 is signed in KSL as illustrated below:

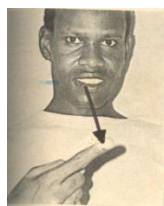


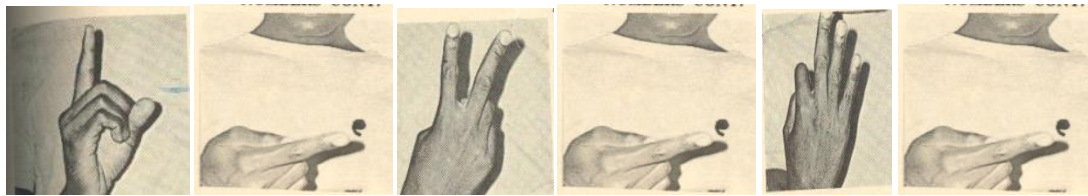
Fig. 21 ONE HUNDRED

ONE HUNDRED or A HUNDRED is signed using the index finger hand form. Place of production (location) is on the lower lip moves to the zero location in-front of the signer. 100-500 are monomorphemic signs since they are produced using one hand. TWO HUNDRED is signed using the V- hand form for TWO in KSL. It is also produced on the lower lip and moves to the zero location. THREE HUNDRED is signed using the W- or F- hand forms for THREE also produced at the lower lip and moving to a neutral position in front of the signer. FOUR HUNDRED is produced by the B-hand form with fingers apart from lower lip to a neutral position in front of the signer. FIVE HUNDRED on the other hand is signed slightly different. It starts with an open palm hand form facing upwards located at the lower lip that moves to the zero location in front of the signer and terminates as a FIVE. In other wards TWO HUNDRED to FOUR HUNDRED are signed just like ONE HUNDRED but with variation of the hand shape.

Numerals from 600- 900 are polymorphemic signs. SIX HUNDRED is signed ONE HUNDRED^SIX. The sign FOR six hundred starts with the index finger hand form on the lower lip for ONE HUNDRED and then that sign moves to come into contact with the sign FIVE which will anticipatorily be in the signing space waiting for that contact to give us SIX HUNDRED. Thus in signing 500-900, for the passive articulator the sign for FIVE is used. For SEVEN HUNDRED, the V-hand shape for TWO HUNDRED moves from lower lip to come

into contact with the FIVE in the zero location in front of the signer to articulate the numeral SEVEN HUNDRED. EIGHT HUNDRED is signed with either the W or F hand form in KSL emanating from the lower lip for THREE HUNDRED and comes into contact with the FIVE hand form waiting in the signing space. NINE HUNDRED is signed by using the B- hand form with fingers spread from lower lip for FOUR HUNDRED and then it comes into contact with FIVE.

Then numerals ONE THOUSAND to FIVE THOUSAND are signed with signs for ONE, TWO, THREE, FOUR and FIVE followed by a comma as illustrated below:



ONE THOUSAND

TWO THOUSAND

THREE THOUSAND



FOUR THOUSAND

FIVE THOUSAND

Fig 22

The comma used on its own in the context of numerals will mean A THOUSAND. As illustrated below:



Fig. 23 A THOUSAND

Numerals from SIX THOUSAND TO TEN THOUSAND are signed first by the numeral followed by the comma. Similarly, from TWENTY THOUSAND (20,000) to NINE HUNDRED THOUSAND (900,000), the sign for the numeral is followed by the comma as shown below:



Fig. 24 TWENTY THOUSAND (20,000) ONE HUNDRED THOUSAND (100,000)

Into the millions, KSL uses two commas after the numeral as exemplified below:

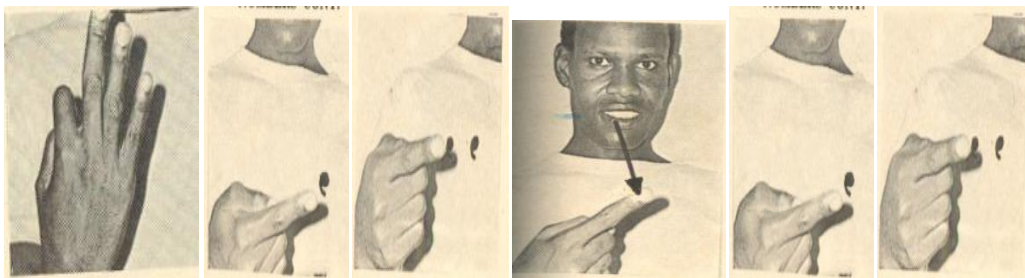
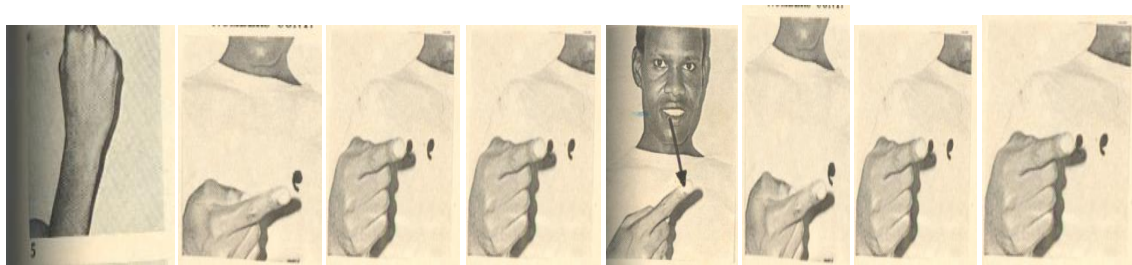


Fig. 25 THREE MILLION ONE HUNDRED MILLION

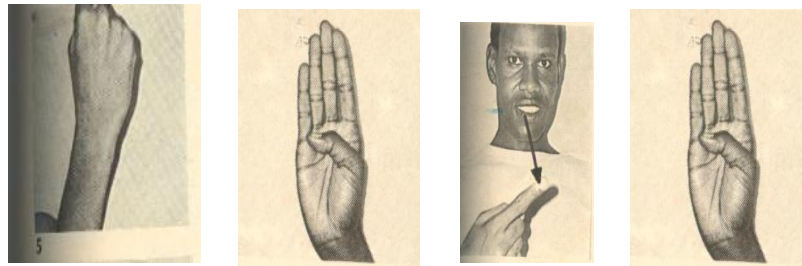
The numerals in the billions are either indicated by use of three commas or the use of letter B of the manual alphabet as exemplified below:



FIVE BILLION

ONE HUNDRED BILLION

OR

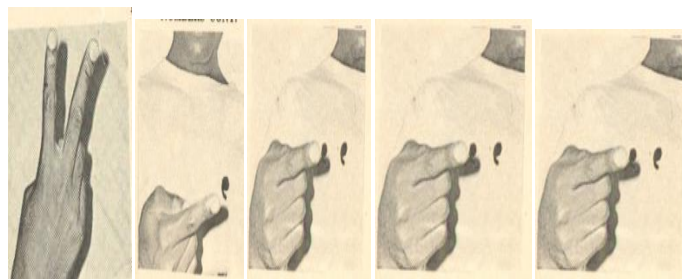


FIVE BILLION

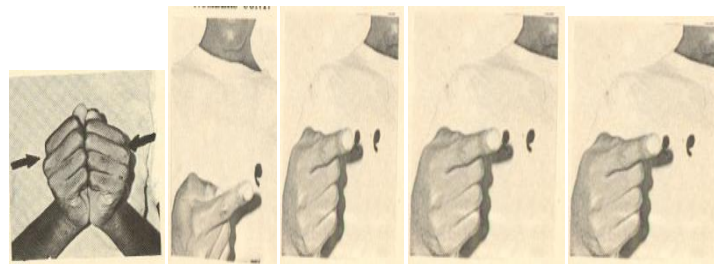
ONE HUNDRED BILLION

Fig 26

The numeral for a trillion is signed with 4 commas or the numeral is followed by the letter T



TWO TRILLION



TEN TRILLION

OR

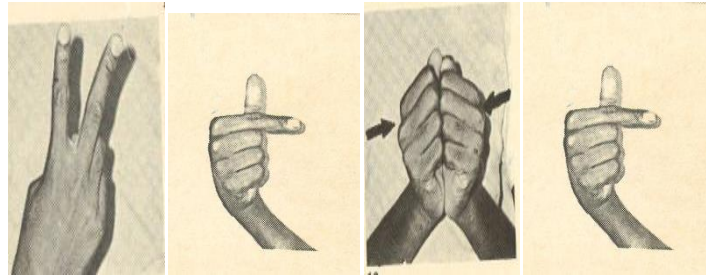


Fig 27

TWO TRILLION

TEN TRILLION

Most users of KSL prefer the use of B and T for billion and trillion respectively as compared to use of successive commas.

1.5 Ordinal Numbers in KSL

As pointed out earlier, ordinal numbers are those that are used in a language to indicate the precise location of something or someone somewhere or at a place. Additionally, they are used to denote the order of something or someone in a list such as 1st – First, 2nd –Second, 3rd –Third, 4th –Fourth, 5th –Fifth, etc. Ordinal numbers are ordinarily sequenced contingent on parameters, such as size, weight, marks, etc. they answer the question “where” or “which.”

In KSL ordinal numbers are signed like the cardinal numbers with a difference in movement. For example the numeral ONE and FIRST are distinguished by the movement parameter as exemplified below:

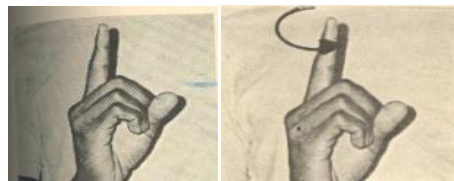


Fig. 28

ONE

FIRST

The same is true for 2nd, 3rd, 4th and 5th as shown below:

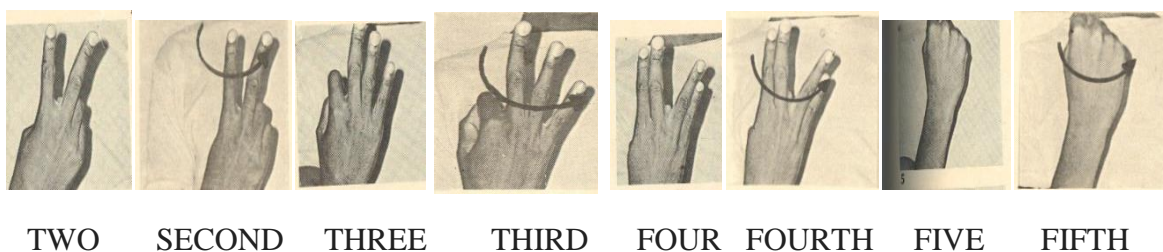


Fig. 29

In signing second, the V- hand shape starts with an orientation facing away from the signer as in signing TWO but then a rotation movement is added making it end up facing the signer. THIRD, FOURTH and FIFTH also use the rotational movement. For the sign THIRD a rotation movement component is added to the sign THREE to make it change orientation to face the signer. FOUTH is also signed with that addition of the rotation movement to number FOUR and change of orientation. In signing FIFTH, the sign FIVE made from the S- hand form moves as it changes orientation from facing away from signer to facing the signer. This is different from what happens in a spoken language, such as English, where there is a patterned way of expressing these ordinal numbers that involves using the last two letters of the word when written e.g. **first** – 1st; **second** – 2nd; **third** – 3rd; **fourth** – 4th. The digits in English use four superscripts as ordinal indicators i.e. st, nd, rd and th when written.

KSL on the other hand does not seem to have a patterned way of signing ordinal numbers from 6- on words. It does not physically incorporate the ST, ND RD and TH in the signing pattern the way it does for 1st- 5th. These elements are some of the aspects of spoken language phonology (English) borrowed into KSL. This is a result of contact between KSL and English. While there is contact between KSL and Kiswahili (though minimal) the national language and official language in Kenya, KSL is not influenced by Kiswahili in its ordinal number system. Kiswahili uses the a- conjunction to modify numerals for instance:

English (cardinal) numbers	ordinal number	Kiswahili cardinal numbers	Kiswahili Ordinal numbers
One	First (e.g. first house)	Moja	Kwanza /y-a kwanza e.g. nyumba y-a kwanza (first house)
Two	Second (e.g. second car)	Mbili	Pili/ l-a pili e.g. gari l-a pili (second car)
Three	Third (e.g. third person)	Tatu	Tatu/ w-a e.g. mtu w-a tatu (three people)

Fig. 30

The -a conjunction is used with numerals especially in ordinal numbers in Kiswahili to modify the numerals by connecting them using the root of -a conjunction as exemplified in the Kiswahili examples Fig. 30 above . The a- conjunction in Kiswahili thus provide us with information about the noun but also connects that information. It however takes different forms depending on the noun class the ordinal number is modifying. It can thus take the y-a, l-a, w-a etc.

Contrary to expectation, given that Kiswahili is both a national and an official language in Kenya, it is apparent that this Kiswahili ordinal number system does not influence KSL; which as indicated earlier is influenced more by English for 1st to fifth. The numerals from 6 onwards do not take the same structure as 1st to 5th. SIXTH in KSL is signed as SIX but the differentiating factor between the two would be the signer’s mouthing pattern. All other ordinal numbers from 6 will be signed the same as the cardinal numbers with the mouthing pattern distinguishing whether it is a cardinal or ordinal number. Mouthing constitutes what is considered the “spoken” components of Sign language.

According to Spence and Woll (1999), mouthing has several uses in SL grammar. However, the one that is relevant to this paper is that it can be used “to represent spoken language mouth pattern in combination with signs.” In KSL, when a signer signs ordinal number above 5, they

accompany that number with an English mouth pattern for ordinal numbers. This is considered to be an element of code switching and code mixing in KSL.

Conclusion

As indicated earlier, numerals are a feature of all languages. Thus all languages have a system or a way that they use to enable its users to associate things or objects with quantity and also enable them allot importance to certain things in real life by assigning them numerical value. This paper has examined to a great detail the different strategies used to generate both cardinal and ordinal numbers in KSL. We have noted in our discussion that in KSL certain signs are used to represent numbers thus culminatively forming the KSL numerical system that is used to show quantity or define a set of values. In this paper we have also examined the articulatory properties or phonological elements of both cardinal and ordinal numbers in KSL. The paper also discussed KSL morphological elements in its numerical system.

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