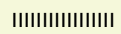




aaaaaaaaA, the language of *somewhere*

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uruwi



aaaaaaaaaaaaaaaa

*A complete grammar*

25 November 2017

*Dedicated to Marek.*

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# | Contents

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0.1	Introduction . . . . .	4
1	Phonology and orthography . . . . .	5
1.1	Phoneme inventory . . . . .	5
1.2	Airflow . . . . .	5
1.3	Phonotactics . . . . .	6
1.4	Allophony . . . . .	6
1.5	The biting affix . . . . .	6
2	The statement space . . . . .	9
2.1	Conceptualisation . . . . .	9
2.2	Application . . . . .	10
2.3	Concrete inflections . . . . .	10
2.3.1	Season class . . . . .	10
2.3.2	Number mutability . . . . .	11
2.4	A simple example . . . . .	12
2.5	Modifiers . . . . .	13
2.5.1	Descriptors . . . . .	14
2.5.2	Quantifiers . . . . .	15
2.6	Pro-forms . . . . .	15
2.6.1	Pro-forms of the zeroeth kind . . . . .	16
2.6.2	Pro-forms of the first kind . . . . .	16
2.6.3	Pro-forms of the second kind . . . . .	17
2.6.4	Pro-forms of the third kind . . . . .	17
2.7	Seasonal cycles . . . . .	18
2.8	Questions . . . . .	18
3	Numerals . . . . .	21
3.1	Fractional numerals . . . . .	22
A	Dictionary . . . . .	23

## 0.1 | Introduction

# 1 | Phonology and orthography

## 1.1 | Phoneme inventory

**Synopsis:** Consonants are in free variation with vowels.

In aaaaaaaaaA, each consonant is interchangeable with a corresponding vowel. Consonants may also have an ingressive pronunciation.

Table 1.1: Phonemes of aaaaaaaaaA.

#	Hacm	Consonant		Vowel
		(Egre)	(Ingr)	
0	f	t'	!	e]
1	n <sup>φ</sup>	ŋ	g'	ã
2	b	p	p	y
3	ɒ	m	ɓ	ũ
4	j	s	s	ĩ
5	ɥ	j	j	i
6	l	tɬ'		ʌ]
7	o	w	w	u
8	φ	k	k	o
9	l	l	l	u
10	ɭ	k'	ɰ	o]
11	n	n	n	ẽ
12	ɾ	r	ɹ	ẽ
13	ɒ	t	t	e
14	h	h	h	a
15	s	ɬ	ɬ	ʌ

When pronounced ingressively, the tones of vowels are inverted. That is, [ʌ]↑ becomes [ʌ]↓.

## 1.2 | Airflow

**Synopsis:** Change of airflow direction has a morphosyntactic basis.

There are two types of airflow: *ingressive* and *egressive*. The direction of airflow is reversed:

- at the beginning of a descriptor
- at certain affixes
- in the middle of certain roots

On a proper noun, as well as on encountering a nasal vowel, the direction is switched to egressive and remains so until it is changed by one of the above methods.

In hacm, switching the direction of airflow is marked by </> (to ingressive) and <\> (to egressive). In dictionaries, a switch in airflow direction (without regard to the final state) is marked using <>.

### 1.3 | Phonotactics

The only phonotactic restriction is that two identical instances of a phoneme may not occur consecutively. If this rule is violated by affixation, then the violation is resolved by:

- replacing the earlier instance with an instance of its predecessor (e. g. /w/ (7) → /tʰ/ (6), wrapping when necessary), and
- replacing the later instance with an instance of its successor (e. g. /w/ (7) → /k/ (8), wrapping when necessary).

### 1.4 | Allophony

The following changes are made:

$$\begin{aligned} lm &\rightarrow p \\ nl &\rightarrow r \\ \text{ɬ} &\rightarrow \text{t}' \quad (\blacklozenge \neg \{\square, \text{t}', \text{k}'\}) \end{aligned}$$

(Here, the symbols for the egressive versions of the consonants are used, but these rules apply during ingressive airflow as well.)

Thus, for instance, /hswlmŋ/ would be resolved to [hswpŋ], which could, for instance, be pronounced [asupā].

### 1.5 | The biting affix

A frequent type of affix encountered in aaaaaaaaA is the *biting affix*, which has the syntax <->δ:ω>. To apply this affix onto a word α:

- Take the last length( $\delta$ ) phonemes of  $\alpha$ , and xor them with  $\delta$  itself using the indices of the phonemes.
- In addition, switch the airflow at the start of the altered phonemes.
- Then append  $\omega$ .
- Resolve any phonotactic violations.

For instance, if we wanted to use  $\langle -\text{y:fn} \rangle$  on  $\langle \text{bɒl} \rangle$ , then we would:

- Take the last letter of  $\langle \text{bɒl} \rangle$ , namely  $\langle -l \rangle$  (9), and xor it with  $\langle -\text{y} \rangle$  (5).  $9 \vee 5 = 12$  so we now have  $\langle -n \rangle$ .
- Append  $\langle -fn \rangle$ . We now have  $\langle \text{bɒ} \rangle \text{fn}$ .





## 2 | The statement space

### 2.1 | Conceptualisation

**Synopsis:** aaaaaaaaaA makes a distinction not between nouns and verbs, but rather between *concretes* and *abstracts*.

Table 2.1: Distinction between concretes and abstracts.

Concretes	Abstracts
Describe concrete objects and actions	Describe abstract concepts, processes and relations
Inflected for gender and number mutability	Not inflected
Mutual order in parameter list is usually significant	Mutual order in parameter list is insignificant

Thus, if  $C_1, C_2, \dots, C_n$  are concretes,  $A_1, A_2, \dots, A_n$  are abstracts, and  $X$  is either a concrete or an abstract, then

$$X(A_1, \dots, A_n, C_1, \dots, C_n) \quad (2.1)$$

means that  $X$  has the properties  $A_1, \dots, A_n$  and involves  $C_1, \dots, C_n$ .

For instance, take the sentence *The sun shines*. This can be translated to **Source**(**Sun**, **Light**). In this case, **Source** is an abstract, and **Sun** and **Light** are concretes. Literally, the translation says that *the sun and light are involved in sourcing, or the sun is a source of light*.

As a more complex example, *On a Sunny morning after the [summer] solstice we started for the mountains* can be translated as:

**Time**(  
**Morning**(**Weather**(**Sun**), **After**(**Summer\_Solstice**)),  
**Walk**(**We**, **Destination**(**Mountain**), **Start**))

## 2.2 | Application

The top level of the statement tree is treated differently from the lower levels. The syntax of the top level is

$$\text{Topic Operator Arguments} \dots \equiv \text{Operator}(\text{Topic}, \text{Arguments}) \quad (2.2)$$

$$\text{Topic Operator Args}_1 \triangle \text{Args}_2 \dots \equiv \text{Operator}(\text{Args}_1, \text{Topic}, \text{Args}_2) \quad (2.3)$$

$$\blacktriangleright \text{Operator Arguments} \dots \equiv \text{Operator}(\text{Arguments}) \quad (2.4)$$

Note that in (2.2) and (2.4), all of the components of the syntax can be concretes or abstracts. In (2.3), Topic must be a concrete, but all other arguments may be concretes or abstracts.

The lower levels use the following syntax:

$$X \ulcorner \text{Arguments} \dots \lrcorner \equiv X(\text{Arguments}) \quad (2.5)$$

Inside the topic, the following is used instead:

$$\lrcorner \text{Arguments} \dots X \urcorner \equiv X(\text{Arguments}) \quad (2.6)$$

At the end of the sentence, any number of  $\lrcorner$ s can be omitted.

Finally, here are the morphemes that aaaaaaaaaA assigns to the special symbols:

Table 2.2: Names of syntactic markers in aaaaaaaaaA.

$\triangle$	js
$\blacktriangleright$	h
$\ulcorner$	->q:fn
$\lrcorner$	b
$\lrcorner$	$\varphi$
$\urcorner$	->rl:bh

## 2.3 | Concrete inflections

### 2.3.1 | Season class

**Synopsis:** *There are five classes open to new concretes, as well as a closed class of season-neutral words.*

In general, if C is of class y, then the processed form of C will be of class y + 1 (or 1 if y = 5).

Table 2.3: Classes in aaaaaaaaaA.

#	(° from VE) Start	End	Name	Archetypes
1	24	96	Late Spring / Early Summer	decorative flora such as flowers, honey, bees
2	96	168	Late Summer / Early Autumn	raw plant-based crops, milk, trees, grass, hot things, rain, most aquatic creatures and insects
3	168	240	Mid Autumn / Early Winter	processed plant-based food, wood
4	240	312	Mid Winter	(meat of) wild animals, frozen or cold things, metals
5	312	24	Late Winter / Early Spring	decorative flora such as flowers, arachnids

### 2.3.2 | Number mutability

*Number mutability* describes how likely the quantity of a concrete is to change. Note that a concrete can only take either a time mutability or a space mutability, not both.

Table 2.4: List of number mutabilities.

Symbol	Name	Description
$\Omega$	Multiversal time-constant	The quantity cannot change <i>under any circumstances</i> , or quantity is meaningless or irrelevant in this context.
$\Psi$	Universal time-constant	The quantity does not change within the current universe, but might be different in other universes.
X	Lifetime-constant	The quantity is unlikely to change to a significant degree within one's lifetime.
Z	Lifetime-enumerable	The quantity is likely to change one or more times during one's lifetime, but such a change would be a significant life event.
$\Xi$	Continually mutable	The quantity is likely to change within a short time span (usually within seconds or minutes, but can be up to about a month).
$\Phi$	Continuously mutable	The quantity is continuously changing across time.
$\vec{\Omega}$	Multiversal space-constant	The quantity is currently the same across all universes.

Symbol	Name	Description
$\vec{\Psi}$	Universal space-constant	The quantity is currently the same within the current universe, but might be different in other universes.
$\vec{X}$	Domain space-constant	The quantity is unlikely to be different within the current domain.
$\vec{\Xi}$	Continually space-mutable	The quantity is likely to change across a short span of space (usually a few metres, but can exceed hundreds of kilometres).
$\vec{\Phi}$	Continuously space-mutable	The quantity is continuously changing across space.
$\Sigma$	Situational	(in programming) The quantity might depend on the implementation.

Table 2.5: List of number mutability affixes.

S#	Affix 1	Sym	Affix 2
1	$\rightarrow n^\Psi$ :	$\Omega$	lbD
2	$\rightarrow j$ :	$\Psi$	lon <sup>o</sup>
3	$\rightarrow l$ :	X	b $\Omega$ j
4	$\rightarrow b$ :	Z	l $\Omega$ y
5	$\rightarrow n$ :	$\Xi$	DyD
0	$\rightarrow h$ :	$\Phi$	$\Omega$ sI
		$\vec{\Omega}$	lDy
		$\vec{\Psi}$	lhD
		$\vec{X}$	bhl
		$\vec{\Xi}$	Dly
		$\vec{\Phi}$	$\Omega$ rl
		$\Sigma$	ln <sup>o</sup> o

When a concrete acts as a verb, it inherits the number mutability of its first argument.

If the mutability equals that of the previous concrete mentioned in the same sentence, then both the class affix and the mutability affix can be omitted.

## 2.4 | A simple example

Take the sentence *Fish eat flowers*, which would be treed into [Eat](#)([Fish](#), [Flower](#)).

The roots we need are:

- [<boφ>](#) c2 (0) eats (1)
- [<φnl>](#) c2 fish

- $\langle \Omega_{sn} \rangle$  c1 flower

The number of fish that exist change whenever a fish is born or dies. This is quasi-continuous, but technically continual. We can choose either option but we will use  $\Xi$  in this example. We use the same mutability for flowers.

Fronting the topic, we get:

ʎɤn/ɔɥɥ bɔɹɪɥɥ ɒs/ɔɥɥ  
 ɤnɪ-ɔɥɥ bɔɤ-ɔɥɥ ɒsn-ɔnʔ:ɔɥɥ  
 fish-2-ᐃ eat-2-ᐃ flower-1-ᐃ  
 Fish eat flowers.

However, we can omit the affixes on all but the first word, leaving:

\ֆո/յԺԿԸ boֆ ռՏՆ  
 ֆո/հ-յԺԿԸ boֆ ռՏՆ  
 fish-2-Ξ eat flower  
 Fish eat flowers.

Now take the earlier sentence *On a Sunny morning after the [summer] solstice we started for the mountains*, whose tree representation is:

```
Time(  
  Morning(Weather(Sun), After(Summer_Solstice)),  
  Walk(We, Destination(Mountain), Start))
```

Morning(Weather(Sun), After(Summer\_Solstice)) (in topic position) can be translated as:

\p \p fo/lbaj d\p\j\nd\sbh \p \b\p\lbaj j\ndbh \p\j\ndh  
 \p \p \p\l->\nd\sbaj d\p\j\sb->\nd\sbaj \p \b\l->j\sbaj j\nd->\nd\sbaj \p\h->\nd\sbaj  
 \l \l sun-1-X weather-0-\p-\l summer solstice-2-X after-\l morning(X)-\l

The rest of the sentence is thus:

ʃɔ ʁ/bɔɣʌlɪn ɪn ns/nʰn dʌʃɔɣ b ɔɪ  
 ʃɔ ʁɔ-ʔnʰ:ɔɣɔ-ʔɣɪn ɪn nɣ-ʔɣɪn dʌ-ʔn:ɔɣ b ɔɪ  
 time walk-1-ᐅ- speaker(ᐅ) destination- mountain-5-ᐅ start

## 2.5 | Modifiers

**Synopsis:** Modifiers can be divided into two categories: **descriptors** and **quantifiers**.

Table 2.6: Distinction between descriptors and quantifiers.

Descriptors	Quantifiers
General category	Modifiers such as “every”, “some” and “most” that signify a relationship
Open class (derived from concretes and abstracts)	Closed class
Follow the separation rule	Do not follow the separation rule

### 2.5.1 | Descriptors

Semantically, **descriptors** act like expression trees that are covered by their antecedents. For instance, if **Weather** was modified by a descriptor acting like **Sun**, then the resulting tree would be **Weather(Sun)**.

Descriptors can modify only proper expression trees below the top level and not other descriptors.

Descriptors follow the separation rule, which states that:

- A descriptor must fall somewhere after what it modifies.
- A descriptor may not be adjacent to what it modifies, or to any other descriptor modifying the same antecedent.
- A descriptor must fall as early as possible under the above two rules.
- Given  $D_1$  and  $D_2$  which can both occupy a certain position,  $D_1$  is prioritised before  $D_2$  if the antecedent of  $D_1$  falls before that of  $D_2$ .

This yields the following algorithm for getting the next word:

- If there are no eligible outstanding descriptors, then print the next non-descriptor word.
- If there are any eligible outstanding descriptors, then print the one whose antecedent falls the earliest and remove it from the list of outstanding descriptors.

The archetypal form of the descriptor is a straight derivation from an abstract or a concrete whose expression tree is the same word. This avoids the “ $\lceil$ ”-overhead that usually applies. In this form, the direction of airflow is switched at the beginning of the descriptor:

$$\begin{aligned} \langle \phi | h \rangle \text{Morning} &\rightarrow \langle \rangle \phi | h \rangle D(\text{Morning}) \\ \langle j \phi \triangleright \rangle \text{Time} &\rightarrow \langle \rangle j \phi \triangleright \rangle D(\text{Time}) \end{aligned}$$

Note that descriptors are not inflected, even if they come from concretes. Thus the previous example can also be translated as:

$$\backslash \phi \triangleright \phi j / n^{\circ} \Omega s \rfloor j n^{\circ} \backslash \phi | \wedge b l \alpha \phi \backslash n^{\circ} \triangleright h$$

ϕ Dϕjs→h:ns\ jn<sup>ϕ</sup> >fϕ\ >bln ϕlh→d:bh  
 weather-0-ϕ after D-sun D-summer\_solstice morning-<sup>1</sup>  
  
 jϕD jn/bdy\ln ny /ln \rln /dl  
 jϕD jnD→n<sup>ϕ</sup>:dyD→y:ln ny >ln >rln >dl  
 time walk-1-2- destination D-speaker D-mountain D-start

Other descriptors are possible:

Table 2.7: Other descriptors.

Prefix	Input	Output
>f'	C	Inalienable_Possession(C)
>f'n'	C	Association(C)
>ϕb'	C	Property(C)
>ll'	C	Borrow(C)
>jh'	C	Destination(C)

### 2.5.2 | Quantifiers

Quantifiers narrow their antecedents, and include words such as *all* or *some*:

$$\text{All } Xs \text{ are } Ys \equiv X \subseteq Y \quad (2.7)$$

$$\text{Some } Xs \text{ are } Ys \equiv (X \cap Y) \neq \emptyset \quad (2.8)$$

$$\text{No } Xs \text{ are } Ys \equiv (X \cap Y) = \emptyset \quad (2.9)$$

Table 2.8 lists the *conservative* quantifiers of aaaaaaaaaA. These quantifiers satisfy  $Q(X, Y) \iff Q(X, X \cap Y)$ . Quantifiers where this is not the case are listed in table 2.9.

Unlike descriptors, quantifiers are not subject to the separation rule. In fact, *they must immediately follow what they quantify, even if doing so means that a descriptor must be delayed*. This means that the algorithm in subsection 2.5.1 must be modified to read as such:

- If the next word is a quantifier, print that word.
- Otherwise, if there are no eligible outstanding descriptors, then print the next non-descriptor word.
- Otherwise, print the one whose antecedent falls the earliest and remove it from the list of outstanding descriptors.

## 2.6 | Pro-forms

**Synopsis:** Pro-forms are words that replace a statement tree, and there are multiple kinds.

Table 2.8: Conservative quantifiers.

Quantifier (Q)	Translation	Meaning of Q Xes are Y ( $Q(X, Y)$ )
lhq	All	$X \subseteq Y$
qn <sup>o</sup>	Not all	$X \not\subseteq Y$
ny <sup>o</sup>	Some	$(X \cap Y) \neq \emptyset$
blo	None	$(X \cap Y) = \emptyset$
dyo	Most	$ X \cap Y  \geq  X - Y $
phi	At least two	$ X \cap Y  \geq 2$
on <sup>o</sup>	One	$ X \cap Y  = 1$
onn <sup>o</sup>	Half of	$  X \cap Y  -  X - Y   \leq 1$
bl	A finite number of	$ X \cap Y  < \aleph_0$
sjh	A countable number of	$ X \cap Y  \leq \aleph_0$
all	An infinite number of	$ X \cap Y  \geq \aleph_0$
fn <sup>o</sup>	An uncountable number of	$ X \cap Y  > \aleph_0$
lj	Almost all	$ X - Y  < \aleph_0 \wedge  Y  \geq \aleph_0$ $ X - Y  \leq \aleph_0 \wedge  Y  > \aleph_0$

Table 2.9: Nonconservative quantifiers.

Quantifier (Q)	Meaning of Q Xes are Y ( $Q(X, Y)$ )
oqb	$Y \subseteq X$
yno <sup>o</sup>	$Y \not\subseteq X$
phi	$ X  =  Y $
djad	$ X  <  Y $
sjd	$ X \cap Y  \geq  Y - X $

### 2.6.1 | Pro-forms of the zeroeth kind

Strictly speaking, these are not a separate class of words, but rather a set of classless concretes:

- $\langle \text{la} \rangle$  the speaker or writer
- $\langle \text{drl} \rangle$  the listener or reader

Usually, these would mean *I* and *you*, respectively, but that does not always have to be the case.

### 2.6.2 | Pro-forms of the first kind

A previously mentioned concrete may, instead of receiving the usual class / mutability suffix, be referred by its first two segments plus the suffix  $\langle -\alpha \rangle$ :  $\langle \text{phi} \rangle \rightarrow \langle \text{phi}\alpha \rangle$ . These pro-forms can be descriptored as with an ordinary concrete.



### 2.6.3 | Pro-forms of the second kind

This category is the most general of pro-concretes. Pro-forms of the second kind combine:

- A **backref number**: how many words deep? 0 means the previous concrete said by the same speaker, 1 the concrete before that and so on.
- A **relation**: describes the relation to the item referred to:
  - self
  - adversary
  - friend
  - parent (child)
  - teacher (student), and so on

The backref number is a single digit (which means that pro-forms of the second kind can look at only the previous 32 concretes). The relation can be one of the following:

Table 2.10: Relations for pro-forms of the second kind.

Root	Forward	Reverse
sfəl	self	
qsɳʰə	adversary	
ɾəbɥ	friend, ally	
ʋjəl	parent	child
obl	teacher	student

If the forward relation is desired, then the backref number *follows* the relation. If the reverse relation (if applicable) is desired, then the backref number *precedes* the relation.

For instance, <obl**nb**> refers to a teacher of the previously-referred concrete, and <**nb**obl> refers to a student of the previously-referred concrete.

### 2.6.4 | Pro-forms of the third kind

Unlike the other forms of pro-forms, this category deals with abstracts. There are only two:

- <S> refers to a temporal abstract (not necessarily the one that was mentioned the latest)
- <no> refers to a non-temporal abstract

The exact definition of a “temporal abstract” varies from person to person, but it is almost universally understood to include all of <jɤp jɳʰ ɾl ɔl ʋəh>.

Because pro-forms of the third kind are so short, they are seldom used with biting affixes attached. If biting affixes are needed, the abstract is almost always spelt in full.

## 2.7 | Seasonal cycles

Some words are part of a quintuplet  $(X_1, X_2, X_3, X_4, X_5)$  such that their meanings are rotated depending on the current season. They can represent concrete or abstract words, or even a mix of both.

Table 2.11: Seasonal cycling visualised for  $(X_1, X_2, X_3, X_4, X_5)$  meaning  $(m_1, m_2, m_3, m_4, m_5)$  in season 1.

Season	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$
1	$m_1$	$m_2$	$m_3$	$m_4$	$m_5$
2	$m_2$	$m_3$	$m_4$	$m_5$	$m_1$
3	$m_3$	$m_4$	$m_5$	$m_1$	$m_2$
4	$m_4$	$m_5$	$m_1$	$m_2$	$m_3$
5	$m_5$	$m_1$	$m_2$	$m_3$	$m_4$

Perhaps the most well-known quintuplet is  $\langle (f\psi, nsj, \text{don}\phi, hly, old) \rangle$  which, in season 1, correspond to the five seasons in order. Thus, to refer to the second season, one would say:

- $\langle nsj \rangle$  during the first season
- $\langle hly \rangle$  during the fourth season

A cycled concrete with its meaning currently  $m_i$  of some quintuplet of meanings  $(m_1, \dots, m_5)$  will have a class of  $i$ .

## 2.8 | Questions

In aaaaaaaaaA, questions are asked by placing an interrogative marker where the answer is desired and starting the sentence with the corresponding interrogative particle:

Table 2.12: Interrogative words in aaaaaaaaaA.

Particle	Marker	Definition
hrlj	rljh	what, who
fob	obf	when, where
sln	lns	why, how
$\psi\psi n$	$\psi n\psi$	how many, how much
lhq	hql	to what extent

This replaces the top-level  $\blacktriangleright$ , so there is no topic-fronting.

Note that interrogative markers are grammatically abstracts, even when a concrete answer is desired.

Responses are usually given using the particle followed by the answer:

\hrj bo/rllbɔ rjh ɔn\ɔyp  
 hrj ɔɔp-ɔj:lɔɔ rjh ɔnɔ-ɔl:ɔyp  
 P-what eat-2-Ω Q-what bread-3-Ξ  
 Who ate the bread?

\hrj ɪl/ɔlɔɔ  
 hrj ɪlɔ-ɔh:lɔɔ  
 P-what speaker-0-Ω  
 Me.

However, <sln-lns> questions are usually answered with full sentences.

<lhɔ> and <hɔl> are special – they request a number, usually between 0 and 1, inclusive<sup>1</sup>, that states to what degree the hypothesis is true. In that sense, they can be used to ask polar questions.

---

<sup>1</sup>A value less than 0 or greater than 1 can be interpreted as an emphatic answer.



### 3 | Numerals

**Synopsis:** *aaaaaaaaA* supports a variety of bases, and even mixed bases as with *Lek-Tsaro* numerals up to 4199. However, nonrectangular number systems are unsupported.

The basic digits are as follow:

Table 3.1: Basic digits.

#	#	Word	#	#	Word
┌	0	nd	└	16	sj
└	1	sf	└	17	rlj
└	2	sn <sup>o</sup>	└	18	sn
└	3	sy	└	19	rn
└	4	sb	└	20	rl
└	5	rl	└	21	rn <sup>o</sup>
└	6	sl	└	22	nl
└	7	ro	└	23	ny
└	8	sd	└	24	sφ
└	9	sl	└	25	rlh
└	10	rlφ	└	26	nh
└	11	nφ	└	27	sh
└	12	so	└	28	nn
└	13	no	└	29	nh
└	14	rl	└	30	rb
└	15	rl	└	31	nl

Note that if a segment starts the name of any digit, it cannot end the name of any digit, and vice versa, allowing for chaining without triggering phonotactic violations.

Thus a numeral is parsed as such:

- Set  $r := 1, n := 0, c := 1$ .
- For each two-segment chunk, let  $a$  be the digit represented by the segments. Then:
  - If airflow is opposite of starting airflow, then:

- \* If this is the first chunk, then reject.
- \* Otherwise, set  $r := 32$  if  $a = 0$ , else  $r := a$ .
- Otherwise, if  $r = 1$  and this is not the first chunk, reject.
- Otherwise, set  $c := r \cdot c$  then  $n := n + a \cdot c$ .
- Return  $n$ .

For instance,  $\langle \backslash \text{rl} / \text{sj} \backslash \text{syso} \rangle$  represents  $C35_{16} = 3125_{10}$ . This number can also be written:

$\backslash \text{nd} / \text{rh} \backslash \text{ndrl}$   
 $\text{zHt}$   
 $50_{\text{p}0}$

Note that the numeral is spelled out in little-endian order, but displayed using figures in big-endian.

An instance of  $\langle \text{rl} \rangle$  followed by a digit  $d$  is equivalent to a series of  $d$  zeroes, so the same number can be written  $\langle \backslash \text{nd} / \text{rl} \backslash \text{rbsbsf} \rangle$ .

Gramatically, cardinal numerals are considered quantifiers. Ordinal numerals look the same, but are considered descriptors and bear an airflow switch at their beginning.

### 3.1 | Fractional numerals

Fractional parts of a numeral are set off after the integral part (if present), separated by a fractional point  $\langle \diamond \rangle$ , read  $\langle \text{qj} \rangle$ . Then the fractional part is parsed as follows:

- Set  $r := 1, n := 0, c := 1$ .
- For each two-segment chunk, let  $a$  be the digit represented by the segments. Then:
  - If airflow is opposite of starting airflow, then set  $r := 32$  if  $a = 0$ , else  $r := a$ .
  - Otherwise, if  $r = 1$ , reject.
  - Otherwise, set  $c := r \cdot c$  then  $n := n + a/c$ .
- Return  $n$ .

For instance,  $2 \cdot \pi$  can be approximated as  $6.487ED5_{16}$ , which is read:

$\backslash \text{slqj} / \text{sj} \backslash \text{sbsdrdrllnordl}$   
 $\text{J}^{\circ} \text{f} \text{r} \text{J} \text{K} \text{Z}$   
 $6_{\text{G}}487ED5$

In both the spelled-out version and the version using the figures, the digits after the decimal point are in big-endian order.

## A | Dictionary

An entry looks like this:

Ծղա loan (1) is borrowing (0) [from (2)] (modifying) (0)'s (\*) (borrowed)  
From left to right:

1. The entry – the aaaaaaaaA term listed.
2. The part of speech of the corresponding entry:
  - c – a concrete
    - c1 – c5 – of one of five season classes
    - c0 – season-neutral concrete
  - a – an abstract
3. The definition – the gloss for the corresponding entry.
  - (a) (0) – the first argument when used as a stem in an expression tree
  - (b) (1) – the second argument, and so on
  - (c) (\*) – parent (antecedent) of expression tree
4. If applicable, any special grammatical or semantic notes for this term.
5. Optionally, examples of usage.

| (

(Բյֆ, ռՏյ, Եռն՞, հլւ, օրժ) qccccc  
the five seasons (LSp-ESu, LSu-EAu, MAu-  
EWi, MWinter, LWi-ESp)

(Եյֆ, յԻԵ, ՏԻԵ, ռՆԼ, հռ՞ր) qcccaa  
(asparagus, cucumber, carrots, percep-  
tion, life)

(ֆՆճ, ԵԼյ, ռԼհ, ռ՞ճճ, ՏՆԵ) qc-  
cccc (strawberry, peach, pumpkin, ice-  
fruit, citrus fruit) The icefruit is an un-  
usual fruit that grows partially under-  
ground during the winter. It has a mod-  
erately thin skin and its flesh has the con-  
sistency of apples, but tastes slightly bit-  
ter when raw.

## | ʃ

ʃbɒ a finish (modifying) terminative, perfect  
ʃɸɪ c1 sun

## | b

bɒɸ c2 food (0) eats (1)

## | ɒ

ɒɪɪ a start (modifying) inchoative  
ɒɸʃɪ c0 weather  
ɒɪɪ a loan (1) is borrowing (0) [from (2)] (modifying) (0)'s (\*) (borrowed)  
ɒɪɪ c0 the listener or reader, you  
ɒɪɪ c3 bread

## | ʝ

ʝɪɸ a after  
ʝɸɒ a time when (0), (1) (modifying) (\*) happened at the time (0)  
ʝɒɒ c1 walk

## | ɸ

ɸɪɪ c0 morning  
ɸɪɪ c2 fish  
ɸɒɪ a absence it is not true that (0)

## | ɪ

ɪbɪ c1 summer solstice  
ɪɪ c0 the speaker or writer, I

## | n

nɪɪ a destination (0) intends to go to (1) (modifying) to (0)  
nɪɪ a sight (0) sees (1)

## | ɪ

ɪɪ c5 mountain  
ɪɪ a before

## | ɒ

ɒɪɪ a association, relationship (0) is related to (1) [by (2)], (0) is (1)'s (2) (by association) (modifying) (0)'s (\*) (associated)  
ɒɪɪ c1 flower

## | h

hɪɪ a property, belongings (1) is the owner of (0) (modifying) (0)'s (\*) (owned)  
hɪɪ a creation (0) creates (1) (modifying) (\*) created by (0)