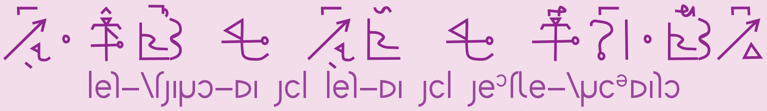

aaaaaaaaaaA, the language of *Rymako*

uruwi

|||||||||||||||||
aaaaaaaaaaaaaaaaa

A complete grammar

25 November 2017

Dedicated to Isoraķatheð.

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0.1 | Introduction

1 | Phonology and orthography

1.1 | Phoneme inventory

Table 1.1: The consonants of aaaaaaaaaaA.

	Bilabial	Alveolar	Palatal	Velar	Glottal
Nasal	m	n	ɲ	ŋ	▨
Plosive	p b	t d	c ɟ	k g	ʔ
Fricative	f	s	ʃ	x	
(coarticulated)	θx	fx		fʃ	▨
Affricate		ts	tʃ		
Lateral fricative	▨	ɬ			▨
Approximant		ɹ	j	w	
Lateral approximant	▨	l			▨
Trill		r		▨	▨

Table 1.2: The vowels of aaaaaaaaaaA.

Spread	Half-rounded	Rounded
i	y̜	y
ɯ	u̜	u
ɛ		œ
ʌ		ɔ
ä		

In addition to consonants and vowels, aaaaaaaaaaA has rod signals, represented by numbers. Rod A is blue and held by one's dominant hand and B is red and held by one's non-dominant hand.

1. Rod A is raised to one's chest, while B is pointed down.
2. Rods A and B are crossed in the front.

3. Rod B is raised upwards in front of the nondominant arm, while rod A is lowered.
4. Rod A is pointed sideways near one's nondominant arm, while rod B is lowered.
5. Rods A and B are extended to the sides.
6. Rods A and B are extended, facing forward.
7. Rod A is raised forward, while B is pointed to the side.
8. Rod B is raised forward, while A is pointed to the side.

Lowering both rods is interpreted as an absence of a rod signal.
If the use of rods are unavailable, the numerals of the positions may be pronounced.

1.2 | Hacmisation

aaaaaaaaaaA uses the hacm script with superscript letters to indicate phonemes not found in Arka. The transcriptions can be found in Tables 1.3 and 1.4.

Table 1.3: The consonants of aaaaaaaaaaA.

	Bilabial	Alveolar	Palatal	Velar	Glottal
Nasal	ᴅ	n	n^{ч}	n^{φ}	▨
Plosive	d b	ɾ Ω	ɾ^{ч} Ω^{ч}	ɿ φ	.
Fricative	ɑ	ȷ	ɭ	h	
(coarticulated)	ȷ^{h}	ɑ^{h}		ɑ^{ɭ}	▨
Affricate		ɾȷ	ɾɭ		
Lateral fricative	▨	s			▨
Approximant		μ	ч	o	
Lateral approximant	▨	l			▨
Trill		ɗ		▨	▨

Table 1.4: The vowels of aaaaaaaaaaA.

Spread	Half-rounded	Rounded
c	c^{ə}	c^{ɔ}
ə^{c}	ə	ə^{ɔ}
e		e^{ɔ}
ɔ^{e}		ɔ
ı		

Rod signs are represented by the hacm digits ⟨1 ˩ ʔ ɱ ᚫ ʕ 9 Δ⟩ attached to the end of the verbs they encompass. Proper words are preceded by a backslash ⟨\⟩.

Vowels that are inferrable from context are sometimes omitted. For example, /ɹɛfan/ (to speak) is written ⟨μeɑn⟩, but /ɹɛfin/ (to spread), which is less common, is written ⟨μeɑcn⟩, with the second vowel. Most of this grammar will leave all vowels written.

1.3 | Phonotactics

An onset consists of one of the following:

- any single consonant other than /l/ (the exceptions are ⟨leɿ⟩ [lɛk] and related words),
- any obstruent followed by an approximant other than /l/,
- or any plosive followed by /r/,
- or any nasal followed by /j/ or /w/.

A nucleus consists of one vowel.
A coda consists of one of the following:

- nothing,
- a nasal,
- a voiceless plosive (excluding /ʔ/),
- /ɹ/, /s/ or /l/

1.4 | Stress

Stress falls on the last syllable with a coda, or otherwise the second-to-last syllable.
See table 1.5 for examples.

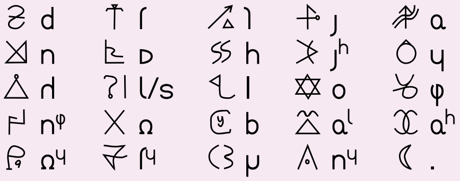
Table 1.5: Examples of stress locations.

Orthography	Location of stress (# from last)
ᴅıȷı	2
nı.cn	1
.əᵓʃəlɔ	2
ɿıȷnedcᵊ	3

1.5 | Vowel harmony

For the purposes of vowel harmony, vowels are divided into front and back vowels. /a/ is neutral. A root with neither front nor back vowels acts as if it has front vowels.

Table 1.6: Single consonants in the script.



d	ɾ	ɿ	ȷ	ɑ
n	ᴅ	h	ȷʰ	ɥ
ᑯ	ɩ/s	l	o	φ
nᵠ	Ω	b	ɑˡ	ɑʰ
Ωᶣ	ɾᶣ	μ	nᶣ	.

1.6 | The script of aaaaaaaaaA

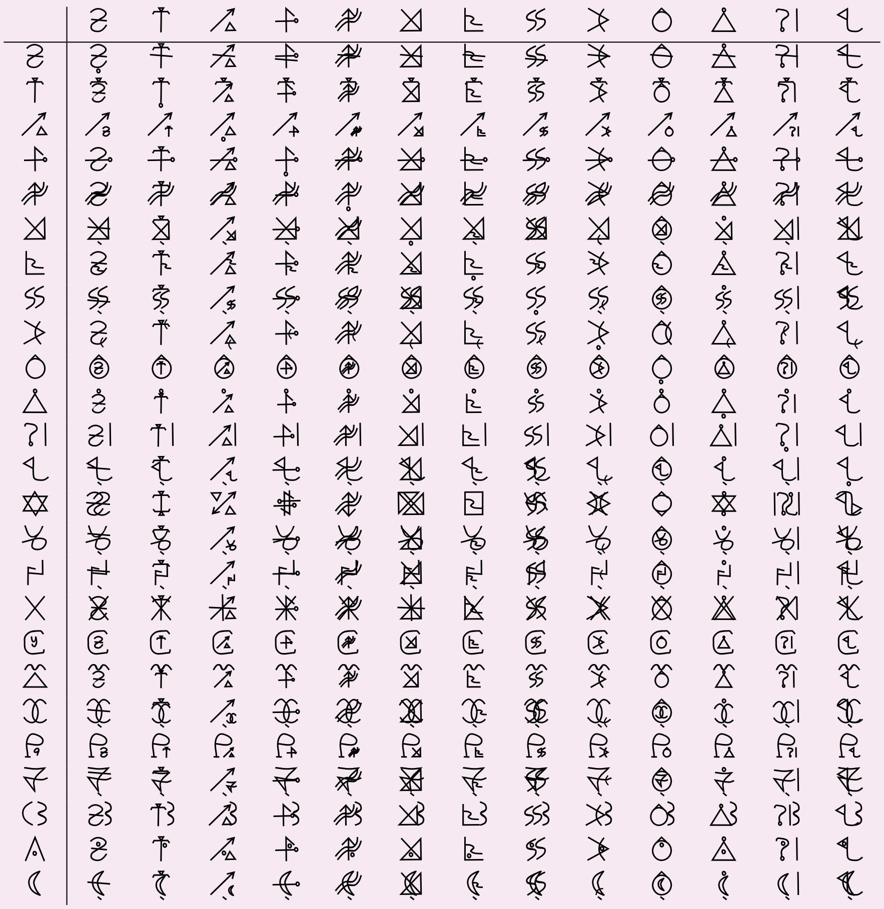
aaaaaaaaaA also uses its own script, inspired by one of Uruwi's old childhood cyphers.

The consonants within a word are divided into pairs (plus one single consonant at the end if applicable). Thus, ⟨dənᵠıdɔᵉ–μı⟩ would have ⟨dnᵠ dμ⟩. These pairs then get a glyph that combines the glyphs for their constituent consonants.

The full table of consonant pairs can be found at tables 1.7 and 1.8. There are some general rules:

- Double consonants get their single-consonant glyphs with a ring below.
- d-coloured glyphs bear the characteristic middle bar of ⟨⟩⟨d⟩: d + l → dl.
- ɿ-coloured glyphs rest under the characteristic arrow of ⟨⟩⟨ɿ⟩: ɿ + ɾ → ɿɾ.
- ɾ-coloured glyphs rest under the characteristic hilt of ⟨⟩⟨ɾ⟩: ɾ + ᑯ → ɾᑯ.
- ȷ-coloured glyphs bear the characteristic bar-and-circle of ⟨⟩⟨ȷ⟩: ȷ + b → ȷb.
- ɑ-coloured glyphs bear the characteristic double-swash of ⟨⟩⟨ɑ⟩: ɑ + nᵠ → ɑnᵠ.
- ᴅ-coloured glyphs bear the characteristic brook of ⟨⟩⟨ᴅ⟩: ᴅ + d → ᴅd.
- ȷʰ-coloured glyphs bear the characteristic arc of ⟨⟩⟨ȷʰ⟩: ȷʰ + ᴅ → ȷʰᴅ.
- ɥ-coloured glyphs rest under the characteristic triangle of ⟨⟩⟨ɥ⟩: ɥ + φ → ɥφ.
- ᑯ-coloured glyphs rest under the characteristic overring of ⟨⟩⟨ᑯ⟩: ᑯ + ɑˡ → ᑯɑˡ.
- ɩ-coloured glyphs rest to the left of the characteristic vertical line of ⟨⟩⟨ɩ⟩: ɩ + Ωᶣ → ɩΩᶣ.

Table 1.7: Consonant pairs in the script.



- o-coloured glyphs are superimposed with a copy rotated either π or, in the case of a few glyphs, π/2: o + ʅ → oʅ; o + h → oh.

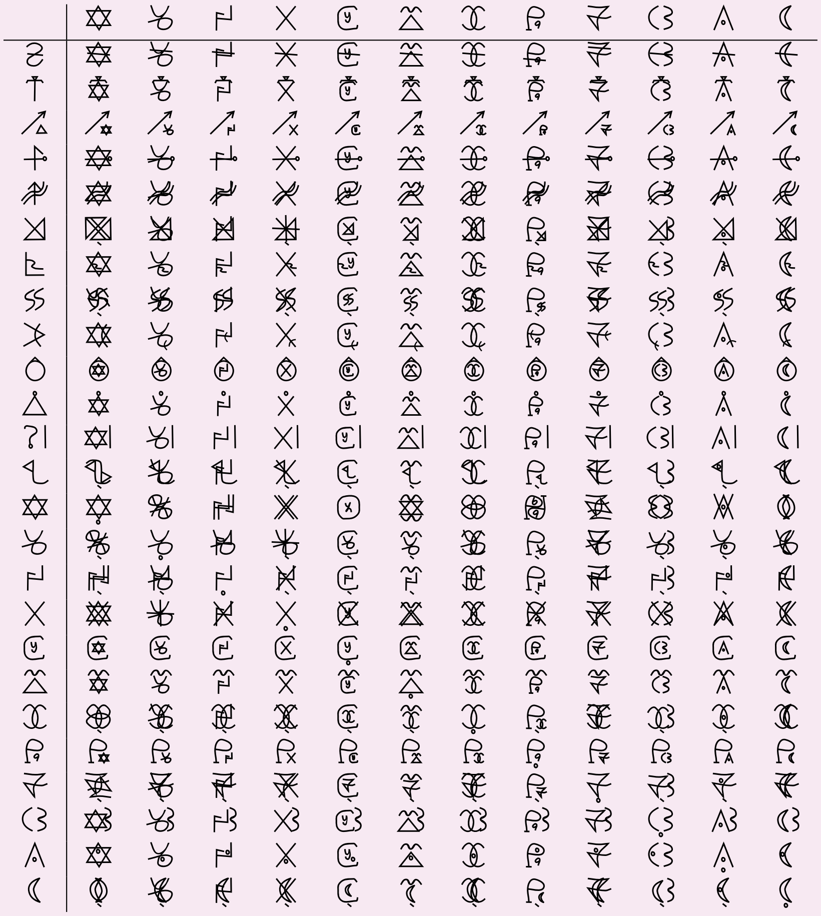
- Ω-coloured glyphs are superimposed with ⟨⟩⟨Ω⟩: Ω + ʃᶣ → Ωʃᶣ. In some cases, the cross might be rotated π/4: Ω + n → Ωn.

- b-coloured glyphs rest inside the characteristic room of ⟨⟩⟨b⟩: b + μ → bμ.

- ɑˡ-coloured glyphs rest under the characteristic flare of ⟨⟩⟨ɑˡ⟩: ɑˡ + . → ɑˡ..

- Ωᶣ-coloured glyphs rest under the characteristic P-shape of ⟨⟩⟨Ωᶣ⟩: Ωᶣ + ȷʰ → Ωᶣȷʰ.

Table 1.8: Consonant pairs in the script.



- µ-coloured glyphs rest to the left of the characteristic flare of ⟨ ⟩⟨µ⟩: µ + nᶣ → µnᶣ.

- nᶣ-coloured glyphs bear the characteristic inner circle of ⟨ ⟩⟨nᶣ⟩: nᶣ + aʰ → nᶣaʰ.

- If all else has failed, the two consonants are superimposed. The default order is the same as the ordering used in table 1.6.

- In coloured-consonant pairs, the colourant is assumed to occur first unless the order is switched by an order reversal mark.

- A negative-sloping mark below a glyph means that the order of consonants is switched.

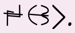
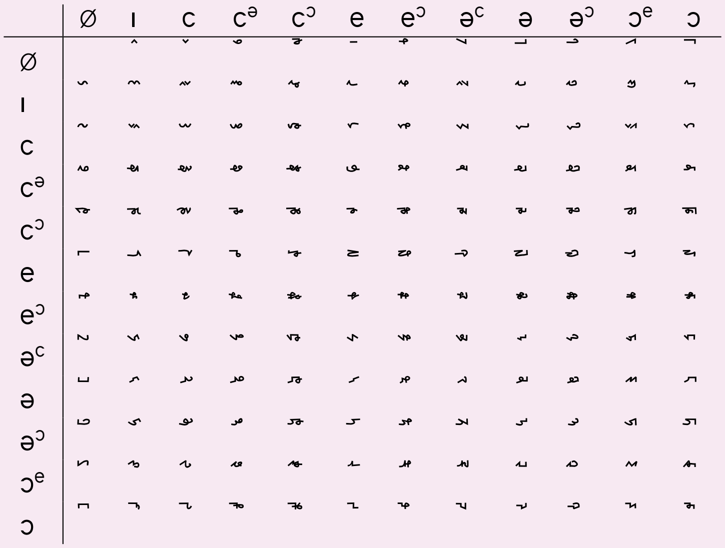
Thus in our case, we would have ⟨⟩. The next step is to add vowels. In our case, they would be paired as ⟨ə–ı ɔᵉ–ı⟩. Note that it is possible for a pair to not have both vowels. The diacritics for the vowels are quite irregular, and they are shown in table 1.9.

Table 1.9: Vowel pairs in the script.


Ø
ı
c
cᵊ
cᴐ
e
eᴐ
əᶜ
ə
əᴐ
ɔᵉ
ɔ
Ø
ı
c
cᵊ
cᴐ
e
eᴐ
əᶜ
ə
əᴐ
ɔᵉ
ɔ

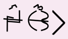
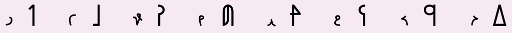
Thus, after adding vowels we get ⟨⟩.

Table 1.10: Miscellaneous symbols.



⁝ ⁝ period (circumfix)

⁚ comma

° name mark (equiv. to ⟨\⟩)

2 | Syntax

2.1 | Basic word order

The basic word order is VSO. Descriptors follow what they modify.

2.2 | Questions

Binary questions have the interrogative polarity marker and no change to syntax.

In wh-questions, the wh-word is pulled to the front (i. e. before the verb). This requires case marking for the wh-word:

ɾlen μeacᵊȷhɪ ncᵓɤ
who-ACC speak-FAR.PAST-Q PR.FAR.SG
Whom did you speak to?

This applies only to questions, not interrogative-mood clauses that act as relative clauses:

μeacᵊȷhɪ ncᵓ ɾlel, ɥɪɾ μɔ.
speak-FAR.PAST-Q PR.FAR.SG who, see-NEAR.PAST PR.ANAPH_OBJ.INT
I saw the person whom you talked to.

2.3 | Multiple clauses

A sentence might have multiple clauses. Each clause in a sentence follows the basic VSO order, and clauses are separated with commas.

3 | Nouns

Nouns are declined for number, case and definiteness.

3.1 | Number

aaaaaaaaaaA has many grammatical numbers:

Table 3.1: The discrete grammatical numbers of aaaaaaaaaaA.

Number	Constraint on $x \in \mathbb{Z}$
Integral	none
Nullary	$x = 0$
Singular	$\|x\| = 1$
Dual	$\|x\| = 2$

Table 3.2: The continuous grammatical numbers of aaaaaaaaaaA.

Number	Constraint on $x \in \mathbb{R}$
Nullary	$x = 0$
Subsingular	$\|x\| < 1$
Supersingular	$1 \leq \|x\| < 2$
Plural	$\|x\| \geq 2$ or x is unknown

3.2 | Case

In a clause with both the subject and object directly expressed in that order, both the subject and object are declined in the nominative case (and their roles are inferred through word order). In a clause where only one is present, or where both are expressed in the opposite order, the subject will receive the nominative case and the object will receive the accusative case.

3.3 | Noun classes

There are three overarching groups of noun classes.

3.3.1 | Countable

Nouns in these classes are declined for a discrete number.

1. Sentient – such as humans, AIs, deities.
2. Animate – nonsentient animals.
3. Inanimate – anything else.

3.3.2 | Measurable

Nouns in this class are declined for a continuous number.

4. Measure – all measurable nouns, especially units of measurement.

3.3.3 | Uncountable

Nouns in these classes are not declined for number, and require compounding with a countable or measurable noun in order to be quantified.

5. Fluid – liquids and gases.
6. Edible – edible (to humans) non-fluids.
7. Inedible – inedible (to humans) non-fluids.
8. Abstract – abstract ideas.

3.4 | Definiteness

The definite form of a noun is formed regularly by reduplicating the first syllable (without the coda): ⟨DIJIJ⟩ “a person” becomes ⟨DIDIJIJ⟩ “the person”.

3.5 | Declension table

3.5.1 | Countable classes

Note that noun declensions respect vowel harmony. For nouns with back vowels, replace the front vowels with the back vowels of the same height and rounding, and vice versa.

Table 3.3: Declensions for countable nouns.

	Integral	Nullary	Singular	Dual

	Integral	Nullary	Singular	Dual
Sentient: ⟨ᴅɪȷɪ⟩ “person”				
Nominative	ᴅɪȷɪ	ᴅɪȷɿe	ᴅɪȷɪȷ	ᴅɪȷɪl
Accusative	ᴅɪȷɪn	ᴅɪȷɪnᵠɿe	ᴅɪȷɪncȷ	ᴅɪȷɪnɪl
Sentient: ⟨ȷʰɪ.en⟩ “magician”				
Nominative	ȷʰɪ.en	ȷʰɪ.eſe	ȷʰɪ.eȷ	ȷʰɪ.el
Accusative	ȷʰɪ.eµcn	ȷʰɪ.enᵠɿe	ȷʰɪ.eµcȷ	ȷʰɪ.eµcl
(Note that the final consonant is preserved only in the integral nominative form.)				
Animate: ⟨ᴅənᵠɔ⟩ “rabbit”				
Nominative	ᴅənᵠɔ	ᴅənᵠɔɿɔᵉ	ᴅənᵠɔȷ	ᴅənᵠɔ.əᶜ
Accusative	ᴅənᵠɔn	ᴅənᵠɔnſɔᵉ	ᴅənᵠɔn	ᴅənᵠɔnəᶜ
Animate: ⟨ȷcᵊl⟩ “fox”				
Nominative	ȷcᵊl	ȷcᵊſe	ȷcᵊȷ	ȷcᵊ.c
Accusative	ȷcᵊµcn	ȷcᵊnᵠɿe	ȷcᵊµcȷ	ȷcᵊµc
Inanimate: ⟨hɪɹdəᵓ⟩ “statue”				
Nominative	hɪɹdəᵓ	hɪɹdəᵓɿɔᵉ	hɪɹdəᵓɿ	hɪɹdəᵓȷ
Accusative	hɪɹdəᵓᴅ	hɪɹdəᵓᴅdɔᵉ	hɪɹdəᵓdɔᵉ	hɪɹdəᵓɑəᶜ
Inanimate: ⟨.cᴅen⟩ “house”				
Nominative	.cᴅen	.cᴅeſe	.cᴅeɿ	.cᴅeȷ
Accusative	.cᴅeµcᴅ	.cᴅeµcᴅde	.cᴅeµcde	.cᴅeµcɑc

3.5.2 | Measurable classes

Table 3.4: Declensions for measurable nouns.

	Plural	Nullary	Subingular	Supersingular
Measure: ⟨µəᴅəᶜ⟩ “day (continuous)”				
Nominative	µəᴅəᶜ	µəᴅəᶜµəᵓ	µəᴅəᶜſ	µəᴅəᶜn
Accusative	µəᴅəᶜn	µəᴅəᶜµəᵓn	µəᴅəᶜnſɔᵉ	µəᴅəᶜnəᶜn
Measure: ⟨ᴅel⟩ “volume” (in expressions such as ⟨ᴅel–ɥəȷɔᵉ⟩ “cupful”)				
Nominative	ᴅel	ᴅeµcᵓ	ᴅeµcſ	ᴅeµcn
Accusative	ᴅeµcn	ᴅeµcᵓn	ᴅeµcnſe	ᴅeµcncn
(Note that the final consonant is preserved only in the plural nominative form.)				

3.5.3 | Uncountable classes

Notably, uncountable-class noun declensions do not respect vowel harmony.

Table 3.5: Declensions for measurable nouns.

	Mass
Fluid: ⟨ɑˡəµəᵓ⟩ “water”	
Nominative	ɑᵊµəᵓ
Accusative	ɑᵊµəᵓn
Fluid: ⟨ɷeɿleᴅ⟩ “nitrogen”	

	Mass
Nominative	ɷeɿeᴅ
Accusative	ɷeɿeᴅcn
(Here, the coda is preserved in the accusative as well.)	
Edible: ⟨ʃeμ.cᵓ⟩ “beef”	
Nominative	ʃeμ.cᵓ
Accusative	ʃeμ.cᵓn
Edible: ⟨ᴅɪn⟩ “rice”	
Nominative	ᴅɪn
Accusative	ᴅɪncn
Inedible: ⟨μəᵓʃɔ⟩ “gold”	
Nominative	μəᵓʃɔ
Accusative	μəᵓʃɔbe
Inedible: ⟨ɿɪɳɪȷ⟩ “stone”	
Nominative	ɿɪɳɪȷ
Accusative	ɿɪɳɪȷde
Abstract: ⟨ɑʰəᵓᴅɔ⟩ “empathy”	
Nominative	ɑʰəᵓᴅɔ
Accusative	ɑʰəᵓᴅɔnᵠ
Abstract: ⟨φcȷ⟩ “[the number] five”	
Nominative	φcȷ
Accusative	φcȷcnᵠ

3.6 | Pronouns

Personal pronouns are not divided into first, second and third persons as in most languages. Instead, they fall into four categories which exhibit different behaviour depending on whether they occur as the first or second noun in the clause:

Table 3.6: Pronoun persons and their functions.

Person	Role in first position	Role in second position
Near	The speaker.	The first argument of the sentence.
Far	The listener.	If the first argument is the speaker, then the listener. Otherwise, the speaker.
Other	A third entity.	An entity that is neither the speaker, the listener nor the first argument.
Generic	A generic entity (akin to “one”).	
Anaphoric Subject	The subject of the previous clause.	
Anaphoric Object	The object of the previous clause.	

In wh-questions, the wh-word assumes the second position and the other argument becomes the first.

If a clause has no explicit arguments, the first argument is understood to be the subject.

Table 3.7: Personal pronouns. ⟨–n⟩, ⟨–en⟩ or ⟨–ɔᵉn⟩ is suffixed for the accusative case.

(continuous) (discrete)	Pl. / Sub. / Sup. Integral	Nullary Nullary	 Singular	 Dual
Near	ɾı	ɿeɾı	ᴅe	ɑcμc
Far	dɔ	ɿɔᵉdɔ	nəᶜ	bμɪ
Other	nc	ɿenc	scᵓ	ɿɪμc
Anaph. Sub.	μɪ	ɿeμɪ	.cᴅ	nᵠcμc
Anaph. Obj.	μɔ	ɿɔᵉμɔ	.əᶜᴅ	nᵠəᶜμɔ
Generic	.əᵓ			

(For the observant readers: notice the similarity to Kavinan’s system.)

3.6.1 | Last-clause pronouns

The anaphoric pronoun ⟨beɹ⟩ (accusative: ⟨beɹen⟩) is grammatically an other pronoun, and it refers to the previous clause said. Likewise, ⟨bedcɹ⟩ (accusative: ⟨bedcn⟩) refers to the clause before the previous one.

3.7 | Compounding

Nouns can be compounded together in a head-initial manner. When that happens, only the leftmost noun is the one to be declined.

ᴅel–μəɹɔᵉ–ɑˡəμəᵓ–φcɹ
volume-cup-water-five
five cupfuls of water

Note that integral pronouns can modify other nouns, in which personal possession is indicated:

ᴅel–μəɹɔᵉ–ɑˡəμəᵓ–φcɹ–ɾı
volume-cup-water-five-PR.NEAR.INTEGRAL
(arg1)’s five cupfuls of water

Descriptors can also compound on nouns. This compounding is productive in aaaaaaaaaA.

ᴅɪɹɪ–ɿəᵓɾı
person-old

old people
(Compare to ᴅɪȷɪ ɿəᵓʃɪ “person old-SENTIENT”.)

3.8 | Possession

“X’s Y” is translated as ⟨Y=ᴅɪ ȷcl X⟩. The possessive construction is also used to create appositives.

Observe that possession marks the head, and ⟨–ᴅɪ⟩ is a clitic, not an affix, as in the following example:

ᴅəᴅənᵠɔȷ–ɑˡəμəᵓ–ᴅɪ ȷcl ȷʰɪ.eȷ
DEF~rabbit-SING-water=GEN POS magician-SING
the magician’s water rabbit

In more casual speech, ⟨ȷcl⟩ may be dropped.

4 Verbs

Verbs are conjugated for person of the subject, tense, polarity and tellicity, in two paradigms. Conjugation respects vowel harmony.

Table 4.1: Person-tense conjugations for verbs, using ⟨ᴅɪɿɪn⟩ "(S) eats (O)".

	Nonpast	Past
Near	ᴅɪɿɪn	ᴅɪɿɪɾ
Far	ᴅɪɿɪn	ᴅɪɿcᵊȷ
Other	ᴅɪɿɪ	ᴅɪɿcᵊ
Anaph. Sub.	ᴅɪɿe	ᴅɪɿel
Anaph. Obj.	ᴅɪɿc.e	ᴅɪɿc.el
Generic	ᴅɪɿcᵓ	ᴅɪɿcᵓ

Table 4.2: Person-tense conjugations for verbs, using ⟨µeɑcn⟩ "(S) spreads (O)".

	Nonpast	Past
Near	µeɑcn	µeɑcɾ
Far	µeɑɪn	µeɑcᵊȷ
Other	µeɑɪ	µeɑcᵊ
Anaph. Sub.	µeɑe	µeɑel
Anaph. Obj.	µeɑc.e	µeɑc.el
Generic	µeɑcᵊ	µeɑcᵊ

to which a suffix is added:

Table 4.3: Polarity-tellicity suffixes for verbs. The interrogative affix can also follow a negative affix.

	Positive	Negative	Interrogative
Telic	–˙	–ɿe / –ɿɔᵉ	–hɪ
Atelic	–ᴅc / –ᴅəᶜ	–ȷɪ	–ɭcᵊ / –ɭə

Notes:

- “Negative atelic” means something akin to “unsuccessfully tried to avoid doing X”.
- The interrogative polarity, in addition to marking questions, is used to mark clauses that may or may not be true but are referred to later in the sentence.

Some examples:

ᴅɪlin sɪɾde ſlɔµɔ.
eat-NEAR.NONPAST fish flower
Fish eat flowers.

ᴅɪlin sɪɾde ſlɔµɔ, ᴅɪlin nyɪµɪ µɪ.
eat-NEAR.NONPAST fish flower, eat-NEAR.NONPAST cat PR.ANAPH_SUB
Fish eat flowers, and cats eat fish.

ᴅɪlin sɪɾde ſlɔµɔ, ᴅɪle µɪſibe.
eat-NEAR.NONPAST fish flower, eat-ANAPH_SUB.NONPAST grass-ACC
Fish eat flowers, and they eat grass.
(Grass is inedible to humans, but edible to fish.)

ᴅɪlinle ſlɔµɔ sɪɾde.
eat-NEAR.NONPAST-NEG flower fish
Flowers don’t eat fish.

dµɪ scᵓ hµchµcɑel, ɟenɪn ſɪ beɟ.
carry-OTHER.NONPAST PR.OTHER.SG DEF~book-SG, worry-NEAR.NONPAST PR.NEAR.INT PR.LAST_CLAUSE
He has the book; that worries me.
or: That he has the book worries me.

dµɪhɪ scᵓ hµchµcɑel, ɟenɪn ſɪ beɟ.
carry-OTHER.NONPAST-INTERROGATIVE PR.OTHER.SG DEF~book-SG, worry-NEAR.NONPAST PR.NEAR.INT PR.LAST_CLAUSE
He might have the book; that worries me.
or: That he might have the book worries me.

4.1 | Aspect

Verbs can also be marked for aspect, either using a rod sign directly on the verb, or a particle with a rod sign, placed anywhere between the verb it modifies and the next verb.

Table 4.4: Aspect markers. Those with hyphens are attached to verb. Those without hyphens are placed as separate particles anywhere after the verb.

Aspect name	Marking	Meaning
Imperfect	–1	An action that is currently going on. Also used to distinguish static actions as opposed to dynamic (e. g. *wear* as opposed to *put on*).
Interrupted	ſlcl1	An action that was interrupted.
Perfect	–⌋	An action that has already finished. Changes present tense to immediate past. Also used to distinguish dynamic actions as opposed to static (e. g. *put on* as opposed to *wear*).
Gnomic	–ʔ	A general truth or aphorism, or an action done habitually.
Gnomic dubitative	ſlclʔ	A general truth or aphorism that the speaker considers to be false.
Deontic necessity	–ɱ	An action that the speaker insists on happening.
Epistemic necessity	ɿəᶜᴅɱ	An action that the speaker infers that is happening.
Deontic potential	–ᛏ	An action that the speaker permits to occur.
Epistemic potential	ɿəᶜᴅᛏ	An action that the speaker infers that might happen.
Unexpected	–ʕ	An action that is unexpected (akin to using “but”).
Comparative	deʕ	Indicates an action of greater intensity than what was described in the previous clause.
Nonexclusive subject	ɿc1	Indicates that the subject comprises not only of what is explicitly mentioned, but also other things.
Nonexclusive object	ɿcʔ	Indicates that the object comprises not only of what is explicitly mentioned, but also other things.
Nonexclusive argument	ɿcɱ	Combination of both nonexclusive subject and nonexclusive object.

An example:

ſlıɱıſᴅc1 ᴅe nc, ɩcnc.elʕ dənᵠıdɔᵉ–μɪ.
fight-NEAR.PAST-ATELIC-IMPERFECT PR.NEAR.SG PR.OTHER.INT, shoot-ANAPH_OBJ.PAST-UNEXPECTED knee-SG.ACC-PR.ANAPH_SUB.INT
I tried to fight them, but they shot my knee.

4.2 | Obliques

aaaaaaaaaaA lacks oblique arguments. Instead, equivalent expressions employ serial verb constructions. For instance, “he ate soup with a spoon” would be reduced to “he held a spoon and ate soup”:

dµcᵊ scᵓ ɑɔᵉlɔᵉl, ᴅılel sıdȷcn.
INST-OTHER.PAST PR.OTHER.SG spoon-SG, eat-ANAPH_SUB.PAST soup-ACC
He held a spoon and ate soup.
or: He ate soup with a spoon.

Likewise:

nı.ı nc ȷəȷəl–hı.ıµ, ncᴅe hıhıɾəᵓdɔᵉ.
TEMPORAL-OTHER PR.OTHER.INT DEF~day-SG-spring, dance-ANAPH_SUB DEF~statue-SG.ACC
They will wait until the spring equinox and dance around the statue.
or: They will dance around the statue on the spring equinox.

A similar construction can be used for the negation of obliques:

dµcᵊle scᵓ ɑɔᵉlɔᵉl, ᴅılelʕ sıdȷcn.
INST-OTHER.PAST-NEG PR.OTHER.SG spoon-SG, eat-ANAPH_SUB.PAST-UNEXPECTED soup-ACC
He did not hold a spoon, but ate soup.
or: He ate soup without a spoon.

4.3 | Conjunctions

Conjunctions such as “and” are treated like obliques. For instance, “and” is represented by the verb ⟨ɑcn⟩, and precedes the clause in which the two are used:

ɑcᵊ \µcᵊȷe \ɾıµəl, ᴅılel ɾeµ.cᵓn.
and-OTHER.PAST Ryse Tarul, eat-ANAPH_SUB.PAST beef-ACC
Ryse and Tarul ate beef.

Sufficiently complex nesting may be unrepresentable using only anaphoric referents. The easiest way to resolve this issue is to use definite nouns in place of anaphoric referents.

ɑcᵊ \µcᵊȷe \ɾıµəl, ɑcᵊ ɾeµ.cᵓ sıdȷc, ᴅılcᵊ ᴅıᴅıȷıl µı.
and-OTHER.PAST Ryuse Tarul, and-OTHER.PAST beef soup, eat-OTHER.PAST DEF~person-DU PR.ANAPH_SUB.CONT
[They,] Ryse and Tarul ate beef and soup.

4.4 | Subordinate clauses

Ideas such as “if” or “because” are also expressed with verbs. For example, ⟨nɪ.cn⟩ “wait, when” is also used for “if”:

ʃeɰɿlehɪ, nɪ.cn ʃɪ beȷ, ɑehcn.
rain-OTHER-NEG-Q, wait-NEAR PR.NEAR.INT ANAPH_CLAUSE, play-NEAR
If it doesn’t rain, we will play.

Note the clausal argument to ⟨nɪ.cn⟩, since our condition is an entire clause instead of a noun.

4.4.1 | Conditions

Conditional ideas whose English translations contain “if” can also be expressed in a more concise way, but this usage can sometimes sound colloquial:

ʃeɰɿlehɪ, ɑehcn.
rain-OTHER-NEG-Q, play-NEAR
If it doesn’t rain, we will play.

4.5 | Comparatives

The comparative is a function $\mathrm{cmp} : A \times A \times (A \to \mathbb{R}) \times (A \times A \to \{0,1\}) \to \{0,1\}$, where $\mathrm{cmp}(a, b, f, \sqsupset) = f(a) \sqsupset f(b)$.

Consider the following sentences:

Fish eat flowers more than cats.
More fish eat flowers than cats.

Semantically, they can be translated to:

$$\mathrm{cmp}(\text{fish}, \text{cats}, a \mapsto (\text{\# of flowers eaten by } a), >) \tag{4.1}$$

$$\mathrm{cmp}(\text{fish}, \text{cats}, a \mapsto (\text{\# of } a \text{ that eat flowers}), >) \tag{4.2}$$

The heart of comparatives in aaaaaaaaaA is the quadrivalent verb ⟨ɷɔɰɪn *a* *b* *f* ⊐⟩. Thus:

ᴅɪɿcᵓhɪ ʃlɔɰɔᴅ–ȷʰcn, ɷɔɰɪn sɪɾe nɥɪɰɪ ɰɔ neʃ.
eat-GENERIC-Q flower-ACC.INT-how_many, CMP-NEAR fish cat PR.ANAPH_OBJ.INT >
Fish eat more flowers than cats.

ᴅɪɿcᵓhɪ .əᵓ–ȷʰcn ʃlɔɰɔ, ɷɔɰɪn sɪɾe nɥɪɰɪ ɰɪ neʃ.
eat-GENERIC-Q PR.GENERIC-how_many flower, CMP-NEAR fish cat PR.ANAPH_SUB.INT >

More fish eat flowers than cats.

Note that we place a clause whose argument is the generic pronoun before the comparative clause. From the doran-clause, we refer to the function using the anaphoric pronoun referring to the position of the return value.

Table 4.5: Comparators in aaaaaaaaaA.

⊐	Comparator
>	neɾ
<	ɑɔ^{e}ɿ
=	ɾe^{ɔ}n^{φ}
≥	ɾ^{ɥ}ɪl
≤	ᴅcȷ
≠	.c^{ə}ȷ
≈	μeȷ
≫	ɑ^{h}e
≪	ɾın

4.6 | Ditransitive-like constructions

In English, some verbs such as *give* take two objects: the item being given and the recipient of the item. Since clauses in aaaaaaaaaA can take only one object, translating such verbs requires multiple clauses:

ɾɪφɪɾ ᴅe hμchμcɷen, nebel \μc^{ə}ȷen.
lose-NEAR.PAST PR.NEAR.SG DEF~book, give_to-ANAPH_SUB.PAST Ri^{u}se-ACC
I gave the book to Ryse.

4.7 | Transitivisation

Verbs that are intransitively (i. e. have no object passed at this time) can be turned into a causative form with the prefix ⟨φc–⟩:

ɾlcɾıcɾ ɑμeɑμen^{ɥ}e.
fall-NEAR.PAST DEF~coin
The coins fell.

ᴅe φcɾlcɾıc^{ə} ɑμeɑμen^{ɥ}e
PR.NEAR.SG TRANS-fall-OTHER.PAST DEF~coin
I dropped the coins.

Note that the word order changes to SVO. In addition, the verb is conjugated for its object, rather than the subject as expected. If the following clause uses an anaphoric subject, it refers to the object of the current clause.

Moreover, the verb does not need to be one that can never take an object. In the above example, ⟨ſlcɾlcn⟩ means "(S) falls on (O)". However, if the verb in question is taking an object, it cannot be transitivised directly and a more roundabout way is required:

ſlcɾlcſ aμeaμenᶣe μiſi.
fall-NEAR.PAST DEF~coin grass
The coins fell on the grass.

ᴅe φcſlcɾlcᵊ aμeaμenᶣe, ſlcɾlel μiſibe.
PR.NEAR.SG TRANS-fall-OTHER.PAST DEF~coin, fall-ANAPH_SUB.PAST grass-ACC
I dropped the coins; they fell on grass.
or: I dropped the coins on grass.

4.8 | Clauses with nullary arguments

A clause with one or more arguments that are nullary or modified by nullary-number nouns (either through compounding or possession) will have a negative verb as well:

ᴅəſinɿe ᴅɪȷɿe.
recall-NEAR-NEG person-NULL
No one knows.

ſȷclſinɿe ᴅe ȷɪμſiᴅɪ ȷcl ȷʰɪ.eɿe.
want-NEAR-NEG PR.NEAR.SG ring=GEN POS magician-NULL
I don't want the rings of any magician.

4.9 | The copula

The copula ⟨ȷcn⟩ can take a noun as an object, in which case it can mean identity or membership. (Location is expressed with ⟨lɪn⟩ "be at".) With no object at all, it is used to denote existence.

It can also accept a descriptor, in which case the descriptor is attached before ⟨ȷcn⟩ in the dictionary form.

5 | Descriptors

Descriptors act as adjectives or adverbs. They follow what they modify, and are inflected for the noun class or verbal person of their antecedents.

Table 5.1: Descriptor declensions, using the descriptors ⟨heᴅſı⟩ "large" and ⟨ʅəᵓſı⟩ "old".

Class or person	Declined form	
Sentient	heᴅſı	ʅəᵓſı
Animate	heᴅſı	ʅəᵓſı
Inanimate	heᴅſe	ʅəᵓſɔᵉ
Measure	heᴅſıȷ	ʅəᵓſıȷ
Fluid	heᴅſeȷ	ʅəᵓſɔᵉȷ
Edible	heᴅſc	ʅəᵓſəᶜ
Inedible	heᴅſeᵓ	ʅəᵓſɔ
Abstract	heᴅſcᵊ	ʅəᵓſə
Near	heᴅſıµ	ʅəᵓſıµ
Far	heᴅſıµ	ʅəᵓſıµ
Other	heᴅſeµ	ʅəᵓſeµ
Anaph. Sub.	heᴅſıµ	ʅəᵓſıµ
Anaph. Obj.	heᴅſeµ	ʅəᵓſeµ
Generic	heᴅſcᵓµ	ʅəᵓſəᵓµ

5.1 | Conversion

A noun can be converted to a descriptor by appending ⟨–ȷı⟩.

A descriptor can be converted to an abstract noun meaning "the nature of being ~" by replacing the final ⟨–ı⟩ with ⟨–cnel⟩.

6 | Tree mode

As mentioned in section 4.3, anaphoric referents in a linked-list sentence are sometimes insufficient for expressing even simple sentence structures. While the easiest method of resolving this issue is using definite nouns, aaaaaaaaaA also provides a mode where sentences are not linked lists of clauses, but rather (binary) trees.

6.1 | Activation

Tree mode is enabled automatically when the treeing particle ⟨nчı9⟩ is used, and disabled at the end of a sentence.

6.2 | Branch-switching

The aforementioned particle ⟨nчı9⟩ marks the beginning of the right branch of the tree. The right branch is ended by the particle ⟨nчıΔ⟩, which causes the next clause to join the left and right branches.

(N. B. ⟨nчı9⟩ and ⟨nчıΔ⟩ can occur only between clauses. If the particles are represented by left and right brackets, respectively, then the brackets should match.)

6.3 | Anaphoric pronouns in joiner clauses

In clauses that join two branches, anaphoric pronouns require marking whether the antecedent occurs in the left predecessor ⟨nчı9⟩ or the right predecessor ⟨nчıΔ⟩. This is done by marking the pronoun with ⟨–9⟩ or ⟨–Δ⟩.

Likewise, verbs can be modified with ⟨–9⟩ or ⟨–Δ⟩ to indicate which branch the subject came from.

6.4 | Errors

The following are ungrammatical:

- Using the particle ⟨nчıΔ⟩ or the branched anaphoric pronouns when tree mode is disabled

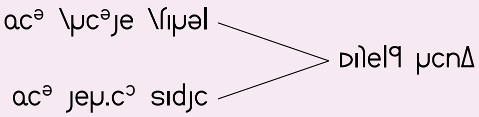
- Using the particle ⟨nᶣıΔ⟩ other than to close a corresponding ⟨nᶣıᑫ⟩
- Using the unbranched anaphoric pronouns in clauses with two predecessors
- Using the branched anaphoric pronouns in clauses with one predecessor
- Starting a new branch with ⟨nᶣıᑫ⟩ when the current branch is empty

6.5 | Example

The second example in section 4.3 can be expressed as follows:

ɑcᵊ \µcᵊȷe \ſıµəl, nᶣıᑫ ɑcᵊ ȷeµ.cᵓ sıdȷc, nᶣıΔ ᐅıʅelᑫ µcnΔ.

The resulting tree is shown below:



7 | Numerals

aaaaaaaaaaA uses a mixed-base system for its numerals. Numerals are abstract nouns. A Perl 6 program to convert numerals can be found in Section A.3.

7.1 | Single-digit numerals

Here are the numerals for $n < 17$:

Table 7.1: The cardinal numbers from 0 – 16.

base 10	base v	word
0	0	μəᴅ
1	1	ɑcᵊl
2	˩	ʃɪȷ
3	ʔ	Ωᶣeᵓn
4	ⲙ	ɑˡɪμ
5	ϯ	φcȷ
6	ʕ	ᴅɥe
7	q	ʃȷcȷ
8	Δ	dəᵓn
9	L	hed
10	F	bənᵠ
11	7̵	nəᶜ
12	£	leᵓ
13	♯	ȷʰcd
14	A	ɥɪn
15	∀	ʅel
16	ψ	.ɪμ

Note that digits above 9 use capital hacm letters.

7.2 | Numerals up to $19 \cdot 17$

These are represented by two digits. The multiples of 17 are shown below:

Table 7.2: Multiples of 17, up to $18 \cdot 17$.

base 10	base v	word
17	10	selcᵊ
34	⅃0	ᴅılcᵊ
51	ʔ0	ɷᶣeᵓlcᵊ
68	ɱ0	ʃıᴅlcᵊ
85	ᚹ0	φcȷʃcᵊ
102	ʕ0	ᴅɥelcᵊ
119	ᑫ0	ʃȷcȷʃcᵊ
136	Δ0	dəᵓnə
153	L0	helcᵊ
170	F0	bənᵠə
187	7̵0	nəᶜlə
204	£0	ɭeᵓlcᵊ
221	ǂ0	ȷʰcdlcᵊ
238	A0	ɥıncᵊ
255	∀0	ɿelɥcᵊ
272	Ψ0	.ılɥcᵊ
289	Ð0	ȷılscᵊ
306	Ψ̶0	heᴅdcᵊ

Thus $y \cdot 17 + x$ is written $\langle x\text{-}y \rangle$.

7.3 | Numerals up to $13 \cdot 19 \cdot 17 = 4199$

These are represented by three digits. The multiples of $19 \cdot 17$ are listed below:

Table 7.3: Multiples of $19 \cdot 17$, up to $12 \cdot 19 \cdot 17$.

base 10	base v	word
323	100	hıȷıʃın
646	⅃00	ʃıȷıʃın
969	ʔ00	ɷᶣeᵓȷeʃın
1292	ɱ00	ɑˡıɰıʃın
1615	ᚹ00	φcȷıʃın
1938	ʕ00	ᴅɥeȷıʃın
2261	ᑫ00	ʃȷcȷıʃın
2584	Δ00	dəᵓnıʃın
2907	L00	heɑıʃın
3230	F00	bənᵠıʃın

base 10	base v	word
3553	700	nəᶜɟɪɾɪn
3876	£00	leᵓɟɪɾɪn

Thus $(z \cdot 19 \cdot 17) + (y \cdot 17) + x$ is written ⟨*z*-*x*-*y*⟩.

7.4 | Numerals up to and including $4199 \cdot (4199+1)/2 = 8817900$

The numeral for 4199 is ⟨ʅə.ɔləᶜ⟩, written as ⟨1:000⟩.

Likewise, two ⟨ʅə.ɔləᶜ⟩ is written as ⟨⅃:000⟩ and pronounced ⟨ʅə.ɔləᶜ–ɾɪɟ⟩, but the second ⟨ʅə.ɔləᶜ⟩ is one smaller than the first. In other words, ⟨⅃:000⟩ = $4199 + (4199-1) = 8397$.

Table 7.4: “Multiples” of ⟨ʅə.ɔləᶜ⟩.

“Multiple”	Difference from last	Total
(0)		0
1:000	4199	4199
⅃:000	4198	8397
ʔ:000	4197	12594
ɱ:000	4196	16790
ᚨ:000	4195	20985
...		
£ΨⱯ:000	3	8817897
£ΨΨ:000	2	8817899
1::000:000	1	8817900

Thus the nth “multiple” differs from the $(n-1)$th multiple by $(4199+1-n)$ (given $1 \leq n \leq 4199$), and the sum of the first n “multiples” is

$$\begin{aligned} y(n) &= \sum_{i=1}^{n} (4200 - n) \\ &= \frac{1}{2} \cdot (8399 \cdot n - n^2) \end{aligned} \tag{7.1}$$

And likewise, for some given y, the largest “multiple” of ⟨ʅə.ɔləᶜ⟩ not smaller than y has the index

$$N(y) = \left\lfloor \frac{1}{2} \cdot \left(8399 - \sqrt{70543201 - 8 \cdot y}\right) \right\rfloor \tag{7.2}$$

In other words, for any numeral $\langle n_1{:}n_2 \rangle$, $n_1 + n_2$ must be less than 4199.

7.5 | Higher numerals

The *bases* of higher numerals b_i can be derived from the recurrence relation

$$b_i = \begin{cases} 4199 & \text{if } i = 1 \\ \dfrac{b_{i-1} \cdot (b_{i-1} + 1)}{2} & \text{otherwise} \end{cases} \tag{7.3}$$

Then b_i acts as a new triangular base. Equations 7.1 and 7.2 can be generalised to the following:

$$y(n, b_i) = \sum_{i=1}^{n} (b_i + 1 - n) \tag{7.4}$$

$$= \frac{1}{2} \cdot (n \cdot (2 \cdot b_i + 1 - n)) \tag{7.5}$$

$$N(y, b_i) = \left\lfloor \frac{1}{2} \cdot \left(2 \cdot b_i - \sqrt{4 \cdot b_i^2 + 4 \cdot b_i + 1 - 8 \cdot y} \right) \right\rfloor \tag{7.6}$$

It follows that $y(n_1, b_i) + n_2$ is represented as $\langle n_1 :^i n_2 \rangle$ (i colons), and such a numeral must satisfy $n_1 + n_2 < b_i$.

Here are the names of the bases themselves:

Table 7.5: Names of higher bases.

Base	base v	word
b_1	1:000	ʅə.ɔləᶜ
b_2	1::000:000	ᴅeμcᵓʃı
b_3	1:::000:000::000:000	ʃılμəᵓ
b_4		ʊencoɪ

7.6 | Cardinal and ordinal numerals

Cardinal numerals compound to their antecedents; ordinal numerals use the possessive ⟨–ᴅɪ ȷcl⟩ construction:

ᴅᴄɑɪ–ʊᶣeᵓn
child-three
three children

ᴅᴄɑɪȷᴅɪ ȷcl ʊᶣeᵓn
child-SG=GEN POS three
the third child

8 | Derivational morphology

The following methods are used to derive related terms from existing ones.

8.1 | Abstraction

Abstraction is a derivation that takes a non-abstract noun and returns the abstract noun representing the concept of the argument. This formation appends ⟨–ne⟩ or ⟨–nɔᵉ⟩ to the noun.

Examples:

- ⟨hμcɑen⟩ *book* → ⟨hμcɑene⟩ *literature*
- ⟨hɔ˥ı⟩ *cart* → ⟨hɔ˥ınɔᵉ⟩ *transportation*

Note that any double letters collapse into a single.

8.2 | Dematuration

Dematuration is a derivation that takes a noun and returns a noun of the same class that represents an immature form of the argument (not necessarily a diminuitive). ⟨ſc–⟩ or ⟨ſəᶜ–⟩ are prepended to nouns that begin in ⟨ȷ⟩ or ⟨ɭ⟩, or ⟨ȷc–⟩ or ⟨ȷəᶜ–⟩ otherwise.

Examples:

- ⟨ᴅıȷı⟩ *person* → ⟨ȷcᴅıȷı⟩ *child*
- ⟨ſȷɔμəᵓ⟩ *fruit* → ⟨ȷəᶜſȷɔμəᵓ⟩ *unripe fruit*
- ⟨ȷeɗı˥cn⟩ *essay* → ⟨ſcȷeɗı˥cn⟩ *draft*

8.3 | Verb-to-noun conversions

Verb-to-noun conversions involve an operation called *inversion*; this operation swaps certain phonemes of a word:

- front vowels ↔ back vowels
- voiceless plosives ↔ voiced plosives (in any position other than in a coda)
- ɾ ↔ ɿ, d ↔ ɾᶣ (in coda position)
- ɑ ↔ ȷʰ
- ȷ ↔ ɑʰ (in any position other than in a coda)
- h ↔ ɑˡ
- µ ↔ ɦ (in any position other than after a fricative in an onset or in a coda)
- s ↔ l (in any position other than in a coda)
- µ ↔ l (in coda position)
- ɥ ↔ o

For instance, ⟨µɪ.cɾɪn⟩ would be inverted to ⟨ɦɪ.əᶜɷɪn⟩.

All other phonemes are unchanged.

Since all of the conversions below are straightforward, only their names will be mentioned.

Table 8.1: Verb-to-noun conversions, from the inversion of the verb stem.

Name	Affix
Agent	–eᵓnᵠ / –ɔnᵠ
Patient	–eᵓd / –ɔd
Location	–eᵓµ / –ɔµ
Instrument	–ɪɾȷɪ

Table 8.2: An example with ⟨nəᵓbɪn⟩ *to steal*.

Name	Derivation	Meaning
Agent	ncᵓdeᵓnᵠ	thief
Patient	ncᵓdeᵓd	stolen goods
Location	ncᵓdeᵓµ	site of theft
Instrument	ncᵓdɪɾȷɪ	tool used for theft

9 | Names

Names fall into two grammatical categories:

- *Nominal names* act as nouns. They are usually single words.
- *Clausal names* are entire clauses. These names usually refer to places, although a few people have clausal names. In extreme cases, such a name can span multiple clauses.

9.1 | Nominal names

These names act as nouns, and they are preceded by a backslash ⟨\⟩. If the name spans multiple words (as common in foreign names), spaces are escaped by backslashes. No distinction is made between native and foreign names.

Only personal names can stand on their own, and even then, only given or full names. Other names must modify a common noun describing the nature of what is named, in the integral number without definiteness.

Table 9.1: Some examples of nominal names.

Name	Type
\μcᵊɻe	Personal (native)
\ɾıμəl	Personal (native)
\μeᴅcn	Personal (foreign)
dμeᵓᴅe–\oıɭı.c	Place (foreign)

Native names will usually respect vowel harmony. Children of parents who work in professions demanding physical labour (e. g. bricklaying) will usually have names with back vowels. In contrast, those born to parents of professions that do not demand physical strength (e. g. computer programming) will usually bear names with front vowels.

9.2 | Clausal names

These names comprise of one or more clauses. Due to the nature of clausal names, they are all considered native. Most of these names refer to places; personal clausal names are almost always nicknames or such. Orthographically, they are put into square brackets ⟨[]⟩.

Clausal names are used by saying them as their own clauses, then using an anaphoric pronoun to backreference the entity described by the name in question. The type of anaphoric pronoun used varies from name to name. It might be the anaphoric subject pronoun, the object pronoun or the last-clause pronoun.

We call the *referent* the subject, the object or the verb of the last clause, respectively depending on the type of anaphoric pronoun used to refer to the name. If the referent is a noun, it must be declined in the integral number without definiteness.

Here, as common in maps and such, the referent will be capitalised. However, other contexts that make the type of anaphoric pronoun to use clear do not use this type of capitalisation.

Table 9.2: Some examples of clausal names.

Name	Type	Literal meaning
[AEӾѰ€ᴲ dძıʃɟı ʃɔɑɔl]	Place	The trees *covered* the ground
[ᴅəʃı ɸӾEᵌÐE μcᵊ˥–\leɷμcᵓ]	Place	The *city* remembers the Šedrŷ star
[ɑcᵊ ˥μıʃə–ᴅı ɟcl ɟəμ ɟʰı.en–ᴅı ɟcl ˥ıɷcᵓ, φoeɟc.el ɸӾEᵌÐEÐ]	Place	The *city* was founded by the warrior of the sun and the wizard of the moon
[ᴅeɟı \ѰƎTF϶ ɟcᵊl–selcᵊ]	Personal	*Gulto* takes care of 17 foxes

An example of usage:

nı.ı bınen–bəɟ, [ᴅəʃı dμeᵓᴅe μcᵊ˥–\leɷμcᵓ], ɟʰı ᴅɪᴅɪᴊɪᴊ .ᴄᴅ.
wait-OTHER year-future, (name), go-OTHER DEF~person-SG PR.ANAPH_SUB.SG
He will go to Muta Pröme Ryk-Šedrŷ next year.

10 | Calendar

Domain II, which contains *Rymako*, has a day that is 26.99410 hours long. Other figures are given in terms of local days:

Table 10.1: Astronomical measures for Domain II.

Period	Length in local days
Local (synodic) day	1.00000
Sidereal day	0.99699
Tropical year (l_y)	301.94714
Sidereal year	302.03719
Synodic month (l_m)	30.80152
Sidereal month	27.95032

10.1 | Tides

In Domain II, the offset of the sea level due to the tide can be modeled by the following equations:

$$y = y_s + y_m \tag{10.1}$$

$$y_s = A_s \cdot (1 + A_{sa} \cdot \cos(\tau \cdot t)) \cdot \cos(2 \cdot \tau \cdot t) \tag{10.2}$$

$$y_m = A_m \cdot \left(1 + A_{ma} \cdot \cos\left(\frac{\tau \cdot t}{l_m}\right)\right) \cdot \cos\left(\frac{2 \cdot \tau \cdot (1 - l_m) \cdot t}{l_m}\right) \tag{10.3}$$

where:

$$\begin{aligned}
\tau &= 2 \cdot \pi \\
A_s &\approx 0.675 \\
A_{sa} &\approx 0.0532 \\
A_m &\approx 1.267 \\
A_{ma} &\approx 0.176 \\
y &= \text{offset of sea level in metres} \\
t &= \text{time since HAT in local synodic days}
\end{aligned}$$

An exact solution to $dy/dt = 0$ is not known to exist. However, the solutions to this equation can be found numerically. Consult Section A.1 for a Sage program to do so.

As the calendar used by aaaaaaaaaaA uses the high and low tides to count time, it is not synchronised even with days. The basic unit of time in the calendar is the *tidal day* ⟨μəᴅəᶜ⟩ (l_t) – the amount of time between a high tide and the second high tide thereafter, which is, on average, 1.03356 local synodic days, but can vary considerably. Thus:

$$\begin{aligned}
l_m/l_t &\approx 29.80148 \tag{10.4} \\
&\approx 4053/136 \tag{10.5} \\
l_y/l_m &\approx 9.80299 \tag{10.6} \\
&\approx 7215/736 \tag{10.7}
\end{aligned}$$

This suggests that:

1. most months will have 30 days, but every 136 months, 27 months will have only 29.
2. most years will have 10 months, but every 736 years, 145 years will have only 9.

10.2 | Months

Months follow a 136-month cycle wherein the $5n+2$-numbered months (zero-indexed, $n \in \mathbb{N}$) have 29 days and the other months have 30.

The names of months, on the other hand, are determined from their positions relative to the first month of the year:

Table 10.2: The months of the year.

#	Name
0	ɑəᵓbəᵓ
1	µcᵊ.eᴅ
2	ſȷɪφɔl
3	ᴅəµəȷɪ
4	ɿɗeµɪᴅ
5	ſɔᵉᴅəſ
6	nᵠəµəᶜſ
7	ɭcbclı
8	bɔᴅəᵓɿ
9*	.cȷeᵓµɪ

Days within a month are indexed from one.

10.3 | Years

The lengths of the year follow a 736-year cycle as specified in Figure 10.1. The code used to generate this table can be found in Section A.2.

10.4 | Eras

Years are grouped further into *eras* ⟨ɿıɥɪ⟩, which change on major historical events. The start of a new era resets the month and year cycle. Eras can also start in the middle of a year of the previous era; thus, the start of the year is different for each era. The *crossover date* of an era is the date of the era that coincides with the first day of the next; in other words, it is the date immediately after the last day of the era.

Table 10.3: The months of the year.

Name	Crossover date	Days between	Cumulative
ɿıɥɪ–µəɿɔᵉ	⋔ ɿɗeµɪᴅ L∆⅃	889726	889726
ɿıɥɪ–ɿəᵓſı	1⅃ ſȷɪφɔl ʕ∀ʕ	642508	1532234
ɿıɥɪ–ɿıȷnedcᵊ	∆ ɭcbclı ⅃ʔ£	207366	1739600
ɿıɥɪ–nchel	(to present)		

The first day of ⟨ɿıɥɪ–nchel⟩ coincides with the founding of the (not yet named).

Figure 10.1: Table of year lengths in a cycle.

```
   0123456789 |     0123456789 |     0123456789 |     0123456789
 0 XXXXX9XXXX |  19 XX9XXXX9XX |  38 9XXXX9XXXX |  57 XXX9XXXX9X
 1 9XXXX9XXXX |  20 XXX9XXXX9X |  39 9XXXX9XXXX |  58 XXX9XXXX9X
 2 9XXXX9XXXX |  21 XXX9XXXX9X |  40 9XXXXX9XXX |  59 XXX9XXXX9X
 3 9XXXX9XXXX |  22 XXX9XXXX9X |  41 X9XXXX9XXX |  60 XXXX9XXXX9
 4 9XXXX9XXXX |  23 XXX9XXXX9X |  42 X9XXXX9XXX |  61 XXXX9XXXX9
 5 9XXXX9XXXX |  24 XXX9XXXX9X |  43 X9XXXX9XXX |  62 XXXX9XXXX9
 6 9XXXX9XXXX |  25 XXX9XXXX9X |  44 X9XXXX9XXX |  63 XXXX9XXXX9
 7 X9XXXX9XXX |  26 XXX9XXXXX9 |  45 X9XXXX9XXX |  64 XXXX9XXXX9
 8 X9XXXX9XXX |  27 XXXX9XXXX9 |  46 X9XXXX9XXX |  65 XXXX9XXXX9
 9 X9XXXX9XXX |  28 XXXX9XXXX9 |  47 XX9XXXX9XX |  66 XXXX9XXXXX
10 X9XXXX9XXX |  29 XXXX9XXXX9 |  48 XX9XXXX9XX |  67 9XXXX9XXXX
11 X9XXXX9XXX |  30 XXXX9XXXX9 |  49 XX9XXXX9XX |  68 9XXXX9XXXX
12 X9XXXX9XXX |  31 XXXX9XXXX9 |  50 XX9XXXX9XX |  69 9XXXX9XXXX
13 X9XXXXX9XX |  32 XXXX9XXXX9 |  51 XX9XXXX9XX |  70 9XXXX9XXXX
14 XX9XXXX9XX |  33 XXXXX9XXXX |  52 XX9XXXX9XX |  71 9XXXX9XXXX
15 XX9XXXX9XX |  34 9XXXX9XXXX |  53 XX9XXXXX9X |  72 9XXXX9XXXX
16 XX9XXXX9XX |  35 9XXXX9XXXX |  54 XXX9XXXX9X |  73 9XXXX9
17 XX9XXXX9XX |  36 9XXXX9XXXX |  55 XXX9XXXX9X |
18 XX9XXXX9XX |  37 9XXXX9XXXX |  56 XXX9XXXX9X |

9: 9 months
X: 10 months
```

10.5 | Subdivisions of the day

Lek-Tsaro has two systems for subdividing the day.

10.5.1 | Traditional timekeeping

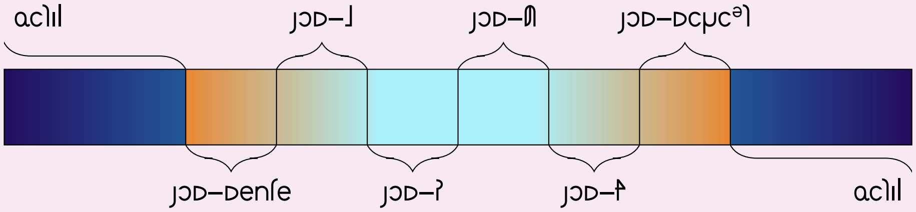
The traditional system of timekeeping relies on subdivisions of the solar day. As shown in Figure 10.2, the period between sunrise and sunset are divided into six equally-sized parts ⟨ȷɔᴅ⟩, and the night is considered a separate category. This implies that the length of the "hours" depends on the seasons.

The traditional timekeeping system is vague – typically, the most precise interval used is a quarter or eighth of an "hour".

10.5.2 | Modern timekeeping

The need for precise schedules necessitated another standard for subdividing the day. The modern system is based on the tidal day, rather than the solar day. In theory, each

Figure 10.2: Hours in traditional timekeeping.


ɑcǀıl
ȷɔɒ–˩
ȷɔɒ–ɱ
ȷɔɒ–ɒcɥcᵊ˥
ȷɔɒ–ɒenʃe
ȷɔɒ–ʔ
ȷɔɒ–ɬ
ɑcǀıl

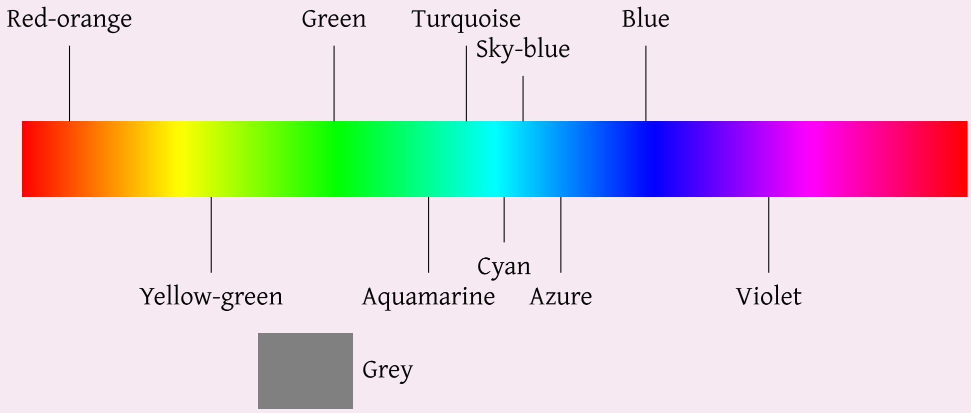
tidal day is divided into 23 equal parts ⟨lın⟩, each of which is divided into 80 equal parts ⟨ȷcne⟩, which are each divided into 40 equal parts ⟨bıɾəl⟩.

Of course, having 23 ⟨lın⟩ per tidal day requires predicting the next two high tides. For that reason, each day’s ⟨lın⟩ are based on the length of the *previous* tidal day, such that each day might have more or less than 23 ⟨lın⟩.

11 | Miscellanea

11.1 | Colour

aaaaaaaaaaA has eleven non-derived colour terms:



Red-orange
Green
Turquoise
Sky-blue
Blue
Yellow-green
Aquamarine
Cyan
Azure
Violet
Grey

Note that “grey” refers generically to a loss of chroma. There is no distinction between a decrease in saturation and a decrease in value.

aaaaaaaaaaA works with colour *transitions*, not static colours, and uses abstract nouns to represent them. See table 11.1.

Table 11.1: Colour transitions in aaaaaaaaaaA. Each row represents a different starting colour; each column represents a different ending colour.

	RO	YG	Gn	Aq	Tu	Cy	SB	Az	Bl	Vi	Gy
RO	hıȷ	ᴅeɿ	ʊᶣen	ɑɪl	ȷʰcµ	dəl	beᵓɾ	ᴅɪl	ɑˡɔᵉd	ɾenᵠ	ᴅc
YG	ᴅɔᵉɾ	µəᵓᴅ	hɔᵉd	ʊcᵊl	nᵠcᵓȷ	ɾeɿ	nᶣɪµ	ɑʰeɾ	ɾȷeᵓnᶣ	ɥed	dəᵓ
Gn	ɾᶣɔᵉn	ɑˡeɾᶣ	ʂeɿ	ɦəᴅ	φɔᵉɾ	nəᶜl	bɔnᶣ	ɭeᵓɾᶣ	ȷcᵊl	ȷʰəᵓȷ	ɿɔ
Aq	ȷʰɪµ	ɾəµ	µcᵊᴅ	ocɿ	ɾᶣəl	.əᶜɿ	ɾɭɔµ	ɿµɔȷ	noed	ɾɦɪd	beᵓ
Tu	ɑəᶜl	nᵠəᵓȷ	ɿeɿ	ʊᶣcᵊµ	ᴅɥen	µcȷ	hɔᴅ	ɾɥel	ȷocɾ	ʊəᵓµ	ɦə
Cy	bcᵊµ	ʊɔᵉɾ	ncᵓµ	.cɾ	ɦəᶜȷ	bɦeɿ	ɾɭcᵓl	nᶣɪɿ	ɑµcn	bəᶜɾ	nɔ
SB	dɔɿ	nᶣɪl	deᵓnᶣ	ɾɭeᵓl	ɑˡeᵓᴅ	ɾɭəᵓµ	oɪd	ȷʰµɔd	den	ɦcd	ɾȷcᵊ
Az	ᴅɪµ	ȷɔᵉɿ	ɭɔd	φɦeᵓȷ	ʊoɔᵉµ	nᶣɪɾ	ɑµeᵓɾᶣ	ɑcȷ	ɾcµ	µəd	oɪ
Bl	heɾᶣ	ɾȷɔnᶣ	ɑʰəµ	nɥɔᵉɾᶣ	ɑʰɥəᶜɿ	ȷʰµəᶜn	bɔᵉn	ʊəᶜl	hɪɿ	ɿcᵊnᵠ	ɥəᵓ
Vi	ʊɔᵉnᵠ	oɔᵉɾᶣ	ɑcᵓȷ	ʊµɪɾᶣ	ɾcᵓl	dcᵓɿ	µəᶜɾᶣ	ɦcᵊɾᶣ	φənᵠ	hɔn	ɑɪ
Gy	ʊɔ	bcᵊ	ɿe	də	µe	ȷc	ɾȷɪ	ɥɪ	ɑʰe	ȷʰc	.cȷ

A Listings of programs

A.1 workfiles/7/tides.sage

```
# How many values to output

limit = int(sys.argv[1]) if len(sys.argv) > 1 else 1000

# :P

tau = 2 * pi

t = var("t")

# Constants

A_s = 0.675; A_sa = 0.0532; A_m = 1.267; A_ma = 0.176; l_m = 30.80152

# Solar component
y_s2 = A_s * (1 + A_sa * cos(tau * t)) * cos(2 * tau * t)
# Lunar component
y_m2 = A_m * (1 + A_ma * cos(tau * t / l_m)) * cos(2 * tau * t / l_m - 2 * tau * t)
y = y_s2 + y_m2
yp = diff(y, t)

# High and low tides occur at values of t where dy/dt = 0.

i = 0
time = 0
print(0)
while i < limit:
  try:
    time2 = find_root(yp == 0, time + 0.000000001, time + 0.35)
    print(time2)
    time = time2
    i += 1
  except:
    time += 0.01
```

workfiles/7/tides.sage

A.2 | workfiles/7/bins.pl6

```
# CONSTANTS

constant \MONTHS_PER_YEAR_CYCLE = 7215;
constant \YEARS_PER_YEAR_CYCLE = 736;
constant \AVG_MONTHS_PER_YEAR = MONTHS_PER_YEAR_CYCLE /
    YEARS_PER_YEAR_CYCLE;

# COMPUTATION
# For each year, take as many months as are needed
# in order to cycle to the next.

my $c = 0;
my @k;

for 0 ..^ YEARS_PER_YEAR_CYCLE -> $i {
  my $need = 1 - ($c - floor($c));
  my $objs = ceiling($need * AVG_MONTHS_PER_YEAR);
  @k[$i] = $objs;
  $c += $objs / AVG_MONTHS_PER_YEAR;
}

# DISPLAY

my \cols = 4;
my $len = @k.elems;

say ("    0123456789" xx cols).join(" | ");

my \total-rows = ceiling($len / 10);
my \rows = ceiling(total-rows / cols);

for 0 ..^ rows -> $j {
  for 0 ..^ cols -> $p {
    print(" | ") if $p != 0;
    my $q = $j + rows * $p;
    next if $q >= total-rows;
    printf("%3d ", $q);
    for 0 ..^ 10 {
      my $i = 10 * $q + $_;
      if $i >= $len { print " "; }
      else {
        print "0123456789XE".substr(@k[$i], 1);
      }
    }
  }
  say "";
}
```

workfiles/7/bins.pl6

A.3 | workfiles/7/conno.pl6

```
my $digits-str = "0123456789TKXSNVFMD";
my @digits = $digits-str.comb;

sub convert-small-fwd($n, $pad = False) {
  die "$n must be < 4199" if $n >= 4199;
  my $a = $n div (19 * 17);
  my $b = ($n div 17) % 19;
  my $c = $n % 17;
  return
    (!$pad && $a == 0 ?? "" !! @digits[$a]) ~
    (!$pad && $b == 0 && $a == 0 ?? "" !! @digits[$b]) ~
    @digits[$c];
}

sub convert-small-back($s) {
  die "$s must be 3 chars or fewer" if $s.chars > 3;
  my $c = $digits-str.index($s.substr(* - 1, 1) // "0");
  my $b = $digits-str.index($s.substr(* - 2, 1) // "0");
  my $a = $digits-str.index($s.substr(* - 3, 1) // "0");
  return $c + 17 * ($b + 19 * $a);
}

sub triangle($n, $p) {
  return ($n * (2 * $p + 1 - $n)) div 2;
}

sub sqrt-floor($y) {
  die "$y is negative" if $y < 0;
  return $y if $y < 2;
  my $small = sqrt-floor($y +> 2) +< 1;
  my $large = $small + 1;
  return $small if $large * $large > $y;
  return $large;
}
sub sqrt-ceil($y) {
  my $n = sqrt-floor($y);
  return $n if $n * $n == $y;
  return $n + 1;
}

sub untriangle($y, $p) {
  return (2 * $p + 1 - sqrt-ceil(4 * $p * $p + 4 * $p - 8 * $y + 1))
    div 2;
}

my @powers = (4199);

for 0 .. 10 {
  my $p = @powers[* - 1];
  @powers.push: $p * ($p + 1) div 2;
}

sub convert-large-fwd-h($n, $i, $pad = False) {
  # base case
  if $i == 0 {
    return convert-small-fwd($n, $pad);
  }
  # recursive
  my $super = untriangle($n, @powers[$i - 1]);
  my $infra = $n - triangle($super, @powers[$i - 1]);
  if $super == 0 && !$pad {
    return convert-large-fwd-h($infra, $i - 1, False);
  }
  return
    convert-large-fwd-h($super, $i - 1, $pad) ~
    (":" x $i) ~
    convert-large-fwd-h($infra, $i - 1, True);
}

sub convert-large-fwd($n, $pad = False) {
  my $i = 0;
  ++$i while @powers[$i] <= $n;
  convert-large-fwd-h($n, $i, $pad);
}

sub convert-large-back($s) {
  # Find the longest run of colons
  my @matches = ($s ~~ m:g/":"+/); #/"
  if (!@matches) {
    return convert-small-back($s);
  }
  my $longest-match = @matches.max(*.chars);
  my $i = (~$longest-match).chars;
  my $left = $s.substr(0, $longest-match.from);
  my $right = $s.substr($longest-match.to);
  my $sup = convert-large-back($left);
  my $inf = convert-large-back($right);
  return triangle($sup, @powers[$i - 1]) + $inf;
}

multi MAIN(Int :$fwd) {
  say convert-large-fwd($fwd);
}
multi MAIN(Str :$back) {
  say convert-large-back($back);
}
```

workfiles/7/conno.pl6

A.4 workfiles/7/count-days.pl6

```
# Count the number of days between 1/0/0 and D/M/Y, inclusive.

# CONSTANTS

constant \MONTHS_PER_YEAR_CYCLE = 7215;
constant \YEARS_PER_YEAR_CYCLE = 736;
constant \AVG_MONTHS_PER_YEAR = MONTHS_PER_YEAR_CYCLE /
    YEARS_PER_YEAR_CYCLE;
constant \MONTHS_PER_MONTH_CYCLE = 136;
constant \DAYS_PER_MONTH_CYCLE = 4053;

# COMPUTATION
# For each year, take as many months as are needed
# in order to cycle to the next.

my $c = 0;
my @k = (0);

for 0 ..^ YEARS_PER_YEAR_CYCLE -> $i {
  my $need = 1 - ($c - floor($c));
  my $objs = ceiling($need * AVG_MONTHS_PER_YEAR);
  @k[$i + 1] = $objs;
  $c += $objs / AVG_MONTHS_PER_YEAR;
}

my @cumk = [\+] @k;

sub months-before-year($year) {
  my $whole-cycles = $year div YEARS_PER_YEAR_CYCLE;
  my $remainder = $year % YEARS_PER_YEAR_CYCLE;
  return $whole-cycles * MONTHS_PER_YEAR_CYCLE + @cumk[$remainder];
}

my @m = (0);

for 0 ..^ MONTHS_PER_MONTH_CYCLE -> $i {
  @m.push: ($i % 5 == 2) ?? 29 !! 30;
}

my @cumm = [\+] @m;

sub days-before-month($month) {
  my $whole-cycles = $month div MONTHS_PER_MONTH_CYCLE;
  my $remainder = $month % MONTHS_PER_MONTH_CYCLE;
  return $whole-cycles * DAYS_PER_MONTH_CYCLE + @cumm[$remainder];
}

sub days-before-date($d2, $m, $y) {
  my $d = $d2 - 1; # d is 0-indexed
  my $bm = months-before-year($y) + $m;
  return days-before-month($bm) + $d;
}

sub MAIN($d2, $m, $y) {
  say days-before-date($d2, $m, $y);
}
```

workfiles/7/count–days.pl6

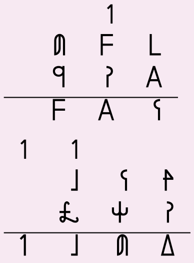
B | Arithmetic in base *v*

This chapter describes algorithms for performing arithmetic operations in Lek-Tsaro's number system.

B.1 | Operations on small numbers

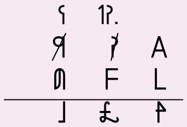
B.1.1 | Additions

If both addends are smaller than 4199, then it is sufficient to use mixed-base addition:



B.1.2 | Subtraction

If both of the operands are smaller than 4199, then it is sufficient to use mixed-base subtraction.



B.1.3 | Determining parity

A number less than 4199 is even iff the sum of its digits in base *v* is even – that is, either none of its digits are odd, or if exactly two are.

B.1.4 | Dividing by two

If a number's base-v representation contains only even digits, then divide each digit by two.

If the representation has two odd digits, then take advantage of the identities

$$
\begin{aligned}
11_v/2 &= 9_v \\
101_v/2 &= 99_v \\
110_v/2 &= T0_v
\end{aligned}
$$

This operation is written as ⟨ᴅ⟩, short for ⟨ᴅyıne⟩ "one half". Thus, in hacm:

- ᴅ11 = L
- ᴅ101 = LL
- ᴅ110 = F0

B.1.5 | Multiplication

With the previous two operations, it is now possible to use peasant multiplication to multiply small numbers.

B.2 | Operations on larger numbers

B.2.1 | Addition

For some $i \in \mathbb{N}$, and two numbers number $a = x_a :^i y_a$ and $b = x_b :^i y_b$, we take advantage of the fact that

$$x_a :^i y_a + x_b :^i y_b = (x_a + 1) :^i y_a + (x_b - 1) :^i y_b + (x_a - x_b + 1) \tag{B.1}$$

$$
\begin{aligned}
x_a :^i y_a + x_b :^i y_b &= (x_a + x_b) :^i y_a + 0 :^i y_b + x_a \cdot x_b && \text{(B.2)} \\
&= (x_a + x_b) :^i (y_a + y_b) + x_a \cdot x_b && \text{(B.3)}
\end{aligned}
$$

Romanisation

In this text, the romanisation is used only to transcribe names into English. Whenever possible, the hacmisation should be used.

Table B.1: The consonants of aaaaaaaaaaA.

	Bilabial	Alveolar	Palatal	Velar	Glottal
Nasal	m	n	ñ	ŋ	▨
Plosive	p b	t d	ť ď	k g	’
Fricative	f	s	š	h	
(coarticulated)	þh	fh		fš	▨
Affricate		ts	tš		
Lateral fricative	▨	ł			▨
Approximant		r	j	w	
Lateral approximant	▨	l			▨
Trill		ř		▨	▨

Table B.2: The vowels of aaaaaaaaaaA.

Spread	Half-rounded	Rounded
i	y	ŷ
ï	u	û
e		ö
ë		o
a		

Rod signs are represented by the Arabic digits ⟨1 2 3 4 5 6 7 8⟩ attached to the end of the verbs they encompass. Proper words are preceded by a backslash ⟨\⟩.

⟨ŋ⟩ should be capitalised as ⟨Ŋ⟩ only if one can depend on the majuscule glyph appearing like an N with a hook. Otherwise, it should be spelled ⟨Ng⟩.

C Dictionary

.

.cᴅen	*ninanim*	house
.əᵓʃəlɔ	*nabst*	sadness, grief

ʃ

ʃɭıµcȷ	*ninanim*	river
ʃɭıhın	*v*	(S) fights (O)
ʃɭcɾcn	*v*	(S) falls on (O)
ʃɭɔµɔ	*ninanim*	flower
ʃɭɔᵉdı	*desc*	sufficient, wanted, wished-for
ʃɭeʅı	*desc*	complete, full, mature
ʃɭel	*nsent*	who?
ʃȷıdɔ	*nabst*	power, magic, motivation
ʃȷcʅcn	*v*	(S) stabs, stings (O)
ʃȷclʃın	*v*	(S) wants (O), benefactive
ʃȷɔµəᵓ	*ninanim*	fruit
ʃɾıȷcn	*v*	(S) answers to (O)
ʃɾeȷc	*nsent*	child (young person)
ʃıφın	*v*	(S) loses, frees (O); (O) escapes
ʃıbµı	*desc*	heavy
ʃɔɑɔʅ	*ninanim*	tree
ʃɔɑɔʅ	*nined*	wood
ʃedcn	*v*	(S) buys (O)
ʃeµ.cᵓ	*nedib*	beef
ʃeµın	*v*	rain (S = other)
ʃəhı	*nsent*	coward, knave
ʃəᶜµɔ	*nined*	blood vessels

ʅ

ʅµıʃᶣəᵓ	*nsent*	warrior
ʅoɔᵉlı	*desc*	potent, powerful not in a physical sense
ʅı.cdı	*nabst*	south
ʅıʅın	*v*	(S) makes a loud noise
ʅıȷnedcᵊ	*ninanim*	mirror
ʅın	*v*	(S) is at (O), locational verb
ʅın	*nmeas*	subdivision of the day cf Grammar / Calendar / Subdivisions of the day / Modern timekeeping
ʅıɷcᵓ	*ninanim*	moon
ʅıɥı	*ninanim*	era
ʅıɾıȷ	*nined*	stone
ʅcʅı	*desc*	all, every
ʅɔn	*desc*	whole, entire
ʅəᵓ.ın	*v*	(S) needs (O)
ʅəᵓʃı	*desc*	old

ɭ

ɭµeᵓncn	*v*	(S) hunts for (O)
ɭcnın	*v*	(S) shoots an arrow to (O)
ɭcl	*nabst*	nature, disposition

ȷ

ȷɪµʃɪ	*ninanim*	ring
ȷcn	*v*	(S) is (O)
ȷcncn	*v*	(S) attaches to, loves (O)
ȷcne	*nmeas*	subdivision of the day cf Grammar / Calendar / Subdivisions of the day / Modern timekeeping
ȷcᵊl	*nanim*	fox
ȷɔᴅ	*nmeas*	subdivision of the day cf Grammar / Calendar / Subdivisions of the day / Traditional timekeeping
ȷɔᵉɷµɪ	*ninanim*	table
ȷe.ɪn	*v*	(S) knows (O) answers (last clause)
ȷenɪn	*v*	(S) is worried by (O)
ȷeɑˡc	*nabst*	daytime
ȷeɗɿlcn	*ninanim*	essay
ȷeᵓʃle	*ninanim*	land, country
ȷəʃɪ	*desc*	many, again
ȷəµ	*ninanim*	day, sun

ȷʰ

ȷʰɪ.en	*nsent*	magician
ȷʰɪn	*v*	(S) goes toward (O)
ȷʰɪµcn	*v*	(S) creates (O)
ȷʰcn	*nabst*	how many?
ȷʰeᵓncn	*v*	(S) befriends (O)
ȷʰən	*nabst*	how much?

n

nɥɪµɪ	*nanim*	cat
nɪ.cn	*v*	(S) waits for/until (O), temporal verb, if
nɪ.eµcn	*v*	(S) covers, spans (O)
ncᴅcn	*v*	(S) dances around (O)
nchel	*ninanim*	group, organisation, order
ncᵓ	*ninanim*	point ncᵓ–ᴅɥɪne halfway point
neɭcn	*v*	(S) swims in (O)
neᴅ	*desc*	male
nebın	*v*	(S) gives something to (O)
neµɑcn	*v*	(S) hides from (O)
neµcʃɪ	*desc*	sudden
nel	*nabst*	nature, temperament, disposition
neldı	*nsent*	mind, brain
nəᵓnın	*v*	(S) kills (O), (O) dies
nəᵓbın	*v*	(S) steals from (O)
nəᵓbɪµɔᵉn	*nsent*	thief

nᵠ

nᵠɔµɪn	*v*	(S) thinks, ponders about (O)

u

uɔᵉµɔ	*nfluid*	poison

ɑ

ɑɥenᶣe	*ninanim*	coin
ɑcȷcn	*v*	(S) obeys (O)
ɑcn	*v*	(S) joins (O), and
ɑcnɷɪ	*desc*	early
ɑcµcn	*v*	touch
ɑcµe	*nabst*	what
ɑcᵊl	*desc*	female
ɑɔᵉɿɔᵉ	*ninanim*	spoon
ɑehcn	*v*	(S) plays with (O)
ɑeocn	*v*	stand, get up
ɑəᵓ	*ninanim*	event, occurrence

ɑˡ

ɑˡɪµe	*nabst*	quote, words, speech
ɑˡe	*ninanim*	what
ɑˡəµəᵓ	*nfluid*	water

ɑʰ

ɑʰəᵓᴅɔ	*nabst*	empathy

ᴅ

ᴅɥıne *nabst* one half
ᴅıɿın *v* (S) eats (O)
ᴅıȷı *nsent* person
ᴅın *nedib* rice
ᴅcɑı *nsent* child (offspring)
ᴅcμᴅeᵓ *nanim* tongue
ᴅcμcᵊɿ *nabst* evening
ᴅɔſın *v* (S) produces (O)
ᴅɔſın *v* (S) is destroyed to make, for (O)
ᴅɔᵉμəᴅ *nanim* scorpion
ᴅeʟcn *v* (S) gives birth to (O), (O) is born (S) is not necessarily the mother; this can be either parent
ᴅeȷcn *v* (S) raises, takes care of, tends to (O)
ᴅenſe *nabst* morning
ᴅeɑμın *v* (S) stands on, is on (O)
ᴅeφın *v* (S) drowns in (O), (O) fills (S)
ᴅedı *desc* in return
ᴅedcn *v* (S) succeeds at (O), (S) does something to (O)
ᴅeμcᵊ *ninam* opposite side
ᴅel *nmeas* volume in expressions such as ᴅel–ɥəȷɔᵉ “cupful”
ᴅelɿı *desc* similar
ᴅelɿcn *v* (S) imitates (O)
ᴅəſın *v* (S) recalls (O)
ᴅənᵠɔ *nanim* rabbit

Ω

Ωınſın *v* (S) is inside (O)
Ωıɑɔ *ninanim* back (body part)
Ωıbə *nabst* life, existence
Ωeɿleᴅ *nfluid* nitrogen
Ωeᴅın *v* (S) sleeps
Ωəᵓμɔ *ninanim* pathway

φ

φɥəᵓnın *v* (S) laughs at (O)
φoeȷın *v* (S) founds (O)
φcſʟı *desc* well (not sick)
φcȷ *nabst* five

d

dɾıſȷı *nabst* ground, floor
dɾen *nanim* owl
dμcn *v* hold, carry, instrumental verb
dμeᵓᴅe *ninanim* city
dıſμın *v* (S) sits at (O)
dıſın *v* (S) dislikes, objects to, disapproves of (O)
dıɾe *ninanim* landmass, domain
dɔſın *v* (S) chases away (O), (O) flees from (S)
deμın *v* (S) wears, experiences (O)
deμeᵓ *nedib* noodles
də.ɔn *nanim* large animal
dənᵠı *ninanim* knee

b

bıne *ninanim* year
bıɾəɿ *nmeas* subdivision of the day cf Grammar / Calendar / Subdivisions of the day / Modern timekeeping
bcȷcn *v* (S) walks to (O)
bəȷ *nabst* future, next (time period)
bəᵓnᵠın *v* (S) succumbs to their impulses
bəᵓᴅɔ *nsent* adult person

h

hμcΩen *ninanim* book
hı.ıμ *nabst* spring (season)
hıȷnɔ *ninanim* nose
hıȷde *ninanim* leaf
hıɾəᵓ *ninanim* statue
hcn *v* (S) claims that (O)
hcμcn *v* (S) is named (O)
hcᵊᴅı *nedib* food

hɔɿı *ninanim* cart
heɑın *v* (S) asks for, requests (O)
heɒʃı *desc* large
həᵓɒı *desc* evil, malicious

ɥ

ɥın *v* (S) sees (O), because ɥın[O=ȷəµ] (“see the sun”) = “wish”

ʮ

ʮıȷın *v* discipline, punish, constrain
ʮcn *v* (S) allows (O)

µ

µı.cʃın *v* (S) is beside (O)
µıʃı *nined* grass
µıʃıbı *ninanim* blade of grass
µıɿın *v* (S) climbs, rises in (O)
µcʃȷcn *v* (S) is (O) old
µcᵊɿ *ninanim* star
µeɑın *v* (S) speaks to (O), (S) asks (O)
µeɑcn *v* (S) spreads (O)
µelɿı *ninanim* place
µeᵓȷı *desc* friendly, kind, considerate, nice
µəɿı *desc* late
µəɿɔᵉ *nabst* nighttime
µəȷɔᵉ *ninanim* cup
µəɒəᶜ *nmeas* tidal day
µəᵓʃɔ *nined* gold

s

sıdȷc *nfluid* soup
sıʮe *nanim* fish
seɷᶣın *v* (S) perceives (O) non-visually

o

oelȷe *nined* forest

l

leɿ *nabst* language
leɿebı *ninanim* a language