Friendly Lojban

A beginner-friendly rewrite of the book "The Complete Lojban Language".

Chapter 1. The Language at a Glance

What is Lojban?

Lojban (pronounced *LOZH-bahn*) is a constructed language — an artificial language deliberately designed rather than evolved naturally over centuries. It has been in development since 1955 and has been used for translation, original prose, and poetry.

What makes Lojban unusual among constructed languages:

- **Unambiguous grammar**: every sentence parses in exactly one way. There is no vagueness about sentence structure.
- **Phonetic spelling**: every letter has exactly one sound range. You read what you hear, and you hear what you read.
- **Predicate-based**: all words, whether they translate as nouns, verbs, or adjectives in English, work the same grammatical way. There are no special noun or verb forms.
- **Culturally neutral**: the root vocabulary was derived from the world's most widely-spoken languages (Chinese, English, Hindi, Spanish, Russian, Arabic) according to speaker population, with sounds and forms adjusted to be unambiguous.
- **Expressive**: some 1,300 root words combine to produce millions of derived words, and the grammar handles tense, mood, evidentiality, logic, and emotion systematically.

You don't need to know logic or linguistics to learn Lojban — but if you enjoy precision, you'll be in good company.

The Alphabet

Lojban uses the standard Latin alphabet minus three letters (*h*, *q*, *w*), plus three punctuation-as-letters: the apostrophe (**'**), the period (**.**), and the comma (**,**).

The full Lojban alphabet in order:

' . , a b c d e f g i j k l m n o p r s t u v x y z

Alphabetical order follows ASCII order, which makes computerized sorting straightforward.

Vowels

Lojban has six vowels. Five are common in content words; **y** appears mainly in compound words and names.

a	as in *father* — an open vowel, never as in *face*
e	as in *get* — a front mid vowel
i	as in *machine* — a front close vowel, never the short *i* of *hit*
o	as in *note* — a back mid vowel, should be a "pure" sound without the English off-glide
u	as in *cool* — a back close vowel, never the short *u* of *but*
y	as in *comma* — the unstressed "schwa" sound [ə]; never as in *misty*

All Lojban vowels should be pronounced clearly and distinctly. There are no silent vowels and no vowels that "reduce" when unstressed — except **y**, which is always the schwa sound.

Consonants

Most Lojban consonants are pronounced as in English, but several need special attention.

c	always like *sh* in *shop* or *c* in *ocean* — never like *k* or *s*
g	always like *g* in *go* — never like *g* in *gem*
j	like *s* in *pleasure* or French *j* in *bonjour* — the voiced counterpart of **c**
s	always like *s* in *sell* — never like *z* as in *rose*
x	like *ch* in Scottish *loch*, German *Bach*, or Spanish *José* — a raspy sound at the back of the throat
r	any rhotic sound is acceptable: English *r*, Spanish trilled *r*, Russian *p*, etc.

Two English consonant combinations become two-letter sequences in Lojban:

- The *ch* sound of *church* is written **tc** (IPA `[tʃ]`)
- The *j* sound of *judge* is written **dj** (IPA `[dʒ]`)

Doubled consonants never appear in Lojban. All consonants must be clearly distinct from their neighbors.

The Three Special Characters

The apostrophe (') represents a short *h* sound (IPA `[h]`). It appears only between vowels, where it separates them into two distinct syllables while keeping them in the same word. Think of it as a "soft h" — a gentle breath between vowels.

ta'e	*habitually* — the **a** and **e** are two separate syllables: *tah-heh*
u'i	an interjection of amusement (pronounced *oo-hee*, not *wee*)

The period (.) marks a mandatory pause or glottal stop (IPA `[ʔ]`). Every word beginning with a vowel must be preceded by a pause, and every word ending in a consonant must be followed by one. Periods are technically optional to write (the rules already require the pauses), but writers include them as a guide for readers.

.i	*[sentence separator]* (the period forces a clear break before the **i**)
.alis.	the name *Alice* (pauses before and after mark it as a name)

The comma (,) marks a syllable break within a word without any pause — the opposite of the period. It is used mainly in names that have adjacent vowels that should not merge into a diphthong, or to mark syllabic consonants (**l**, **m**, **n**, **r**). Commas are never required and never change a word's identity.

Diphthongs

A diphthong is two vowel sounds pronounced as a single syllable. Lojban has four diphthongs freely used in ordinary words:

ai	as in *high* — IPA [aj]
ei	as in *weigh* — IPA [ɛj]
oi	as in *boy* — IPA [oj]
au	as in *cow* — IPA [aw]

Ten more diphthongs exist but appear only in names and borrowed words:

On-glide with **i** (like English *y*)	On-glide with **u** (like English *w*)
ia (*ya*), **ie** (*yeh*), **io** (*yo*), **iu** (*you*), **ii** (*yee*)	**ua** (*wa*), **ue** (*weh*), **uo** (*wo*), **uu** (*woo*), **ui** (*wee*)

When two vowels appear together without an apostrophe, they form a diphthong. With an apostrophe between them, they are two separate syllables. Compare:

ui	one syllable: *wee* (an interjection of happiness)
u'i	two syllables: *oo-hee* (an interjection of amusement)

Stress

Lojban stress is regular and predictable:

1. **Stress falls on the second-to-last vowel** (not syllable — vowel) in every word, with one exception: if that vowel is **y**, skip back to the third-to-last vowel.
2. **Single-syllable words** carry no stress.

Examples:

ta·vla	*to talk* ⟶ stress on first syllable: *TAV-la* (the **a** of **ta** is second-to-last)
clu·pra	*to produce literature* ⟶ *CLU-pra*
blo·ti	*boat* ⟶ *BLO-ti*
ci·dj·ba·u	four syllables ⟶ stress on second-to-last vowel **ba**: *ci-DJI-ba-u*... actually **cib·ja·u** — stress the second-to-last vowel **ja**: *cib-JA-u*

In practice, stress in common short words becomes natural quickly. The key rule to remember: **stress the second-to-last vowel, never the last**.

Capitalization is only used in *names* to indicate non-standard stress (stress that does not follow the default rule). For example, the Lojbanized form of *Josephine* is written **DJOsefin.** to show that the first syllable is stressed, not the second-to-last.

Reading Lojban Aloud

Lojban is a phonetic language: every word is pronounced exactly as written, and every spoken sound maps to exactly one written form. There are no silent letters, no irregular spellings, and no exceptions.

A few practical tips for beginners:

- **Vowels are long and clear**. Don't reduce unstressed vowels (except **y**).
- **Each letter is one sound**. The letters **c**, **g**, **j**, **x** each represent a single fixed sound — resist any English spelling intuitions.
- **Consonant clusters at word beginnings** are normal in Lojban. Words like **klama** (*go*), **broda** (*some-relation*), and **spuda** (*respond*) are typical. If you struggle with a cluster, a very short, quiet **y**-like schwa between the consonants is accepted colloquially.
- **The period is a real pause**. Don't swallow it.

Here are a few words to practice reading aloud:

coi	*hello* (pronounced *SHOY*, one syllable)
co'o	*goodbye* (pronounced *SHO-ho*, two syllables)
mi	*I / me*
do	*you*
klama	*goes to* (pronounced *KLA-ma*)
tavla	*talks to* (pronounced *TAV-la*)
.a'o	*I hope* (interjection; the period is a real pause before the **a**)

About This Book

This book is a reader-friendly version of *The Complete Lojban Language* (CLL), the authoritative reference grammar written by John Cowan and published by the Logical Language Group. The original CLL is complete and precise — but it was designed as a reference, not a tutorial. Material there is organized by grammatical category rather than by what a learner needs first.

In this book:

- Material is ordered for progressive learning: you can start speaking simple sentences after Chapter 2 and reading basic texts after Chapter 8.
- Examples come from authentic translated Lojban texts wherever possible.
- Technical terminology is introduced gradually, with plain-English explanations first.
- All of the CLL's content is covered — specialist topics like the full tense system, mathematical expressions, and formal grammar appear in later chapters and appendices.
- Word definitions include simplified type annotations: `(object)`, `(event)`, `(property)`, `(proposition)`, `(text)`, `(number)`, `(sound)` — just enough to understand what each place expects.

Cross-references to the original CLL are noted where relevant for readers who want the authoritative technical detail.

How examples and cross-references work

- **Lojban** in examples is usually in **bold**; **glosses** (rough English) are in *italics* on the following line or after an em dash.
- **Blockquoted** lines (>) are teaching examples unless labeled as corpus quotes or dialogue.
- **Internal links** use the form Chapter *n*. All cross-references in this book point to other friendly-cll chapters; the book is designed to be self-sufficient.
- **Elision:** terminators (**ku**, **vau**, **kei**, ...) are often dropped when the parse is obvious; later chapters say when you must keep them.
- **Terms:** *bridi* (claim), *sumti* (argument), *selbri* (predicate) are defined in Chapter 2.
- **Example integrity:** Every Lojban example in this book is sourced from or adapted from the canonical CLL, the *Learn Lojban* course, or the corpora. When an example is adapted (e.g. a character name changed from **la .alis.** to **la .teris.**), the underlying grammar and place structure are kept identical. Examples are never invented from scratch.

Enjoy the language.

coi .lojban.
Hello, Lojban!

Summary

- Examples: **bold** Lojban, *italic* gloss; cross-links via /en/books/friendly-cll/; elision is normal in learner text; examples are sourced from CLL/corpus, never invented
- Lojban uses 26 Latin letters minus h/q/w, plus ', ., ,
- All pronunciation is regular: read what you see, hear what you read
- Vowels **a e i o u** are pure sounds; **y** is the schwa
- **c** = *sh*, **j** = *zh*, **x** = *ch* (Scottish *loch*), **g** always hard

Summary

- ' = breathy *h* between vowels; **.** = pause/glottal stop; **,** = syllable break without pause
- Stress the second-to-last vowel
- Four diphthongs in common words: **ai ei oi au**

Chapter 2. Your First Sentences

The Central Idea: Relationships

In Lojban, the sentence is a **predication** — a claim that certain things stand in a certain relationship. This unit is called a **bridi** (roughly: "predication" or "claim").

Every bridi has two parts:

- A **relation construct** called the **selbri** — this specifies *which* relationship holds.
- One or more **argument terms** called **sumti** — these specify *who or what* is involved in the relationship.

In English, we distinguish between nouns, verbs, adjectives, and adverbs. In Lojban, there are no such distinctions. The word **prami** can act as "love", "lover", "beloved", "loving", or "lovingly" depending on context — it always describes the same underlying relationship.

Three Word Types

All Lojban words fall into one of three categories:

/ **Relation words** (**brivla** in Lojban):

Words that express relationships. They always contain at least one consonant cluster (two consecutive consonants) within their first five sounds and always end in a vowel. Examples: **prami** (love), **klama** (go/come), **citka** (eat), **tavla** (talk)

Brivla come in three subtypes — all grammatically identical, only different in origin:

Subtype	Description	Examples
gismu	Root words: 5 letters, built from world languages	**prami**, **klama**, **citka**, **melbi**
lujvo	Compounds of root-word *rafsi* (combining forms)	**blari'o** (blue-green), **balskami** (great-smelling)
fu'ivla	Borrowings from other languages	**djarspageti** (spaghetti), **krokodilo** (crocodile)

A quick example of each:

> **ta cu klama le zarci**
>
> *That one goes to the market.*
>
> (gismu
>
> *selbri*

)

ta cu blari'o

That is blue-green.

(lujvo

selbri

)

ti cu djarspageti

This is spaghetti.

(fu'ivla

selbri

)

All three work exactly the same way in a sentence — the grammar does not care which subtype you use.

/ **Particles** (**cmavo** in Lojban):

Short structural words — the grammar glue of Lojban. They begin with a consonant followed by a vowel, optionally with more apostrophe-vowel sequences. Particles are often written together without spaces. Examples: **le** (the), **cu** (selbri-separator), **mi** (I), **pu** (past tense)

/ **Name words** (**cmevla** in Lojban):

Names of people, places, etc. They always end in a consonant and are surrounded by pause marks (periods) when written. Examples: **.alis.** (Alice), **.teris.** (Terry), **.lojban.** (Lojban)

Place Structures

Every relation word has a **place structure** — a list of numbered slots that define the roles of the participants. These slots are labeled x_1, x_2, x_3, and so on.

tavla

> x_1 talks to x_2 about topic x_3 in language x_4

prami

> x_1 loves x_2

klama

> x_1 goes/comes to x_2 (destination) from x_3 (origin) via route x_4 by means x_5

citka

x_1 eats x_2

gerku

x_1 is a dog of breed x_2

The place structure is part of every word's definition. When you fill in the slots with arguments, you get a sentence.

Swapping Places: se, te, ve, xe

Sometimes you want to put a different argument in the x_1 slot — for emphasis or because of what is already in context. The particles **se**, **te**, **ve**, **xe** swap x_1 with another place:

Particle	Swaps x_1 with
se	x_2
te	x_3
ve	x_4
xe	x_5

Using **klama** (x_1 goes to x_2 from x_3 via x_4 by x_5):

> **mi klama le zarci**
>
> *I go to the market.*
>
> (x_1=I, x_2=market)

> **le zarci se klama mi**
>
> *The market is gone-to by me.*
>
> (x_1=market, x_2=I — places swapped)

> **le zdani te klama mi le zarci**
>
> *The house is the origin: I go to the market from it.*
>
> (x_1=house, x_2=I, x_3=market — wait, let's be precise: te swaps $x_1 \leftrightarrow x_3$, so x_1=origin=house, x_2=mi, x_3=destination=zarci)

A shorter example with **vecnu** (x_1 sells x_2 to x_3 for x_4):

> **la .teris. vecnu le karce la .alis.**

> *Terry sells the car to Alice.*

> **le karce se vecnu la .teris. la .alis.**
>
> *The car is sold by Terry to Alice.*
>
> (x_1=car, x_2=Terry)

> **la .alis. te vecnu la .teris. le karce**
>
> *Alice is the buyer: Terry sells the car to her.*
>
> (x_1=Alice, x_3 becomes x_1)

Conversions are the standard Lojban way to form *passive-like* constructions and are very common.

The Simplest Sentences

The basic word order is: **x_1 selbri x_2 x_3 ...**

The first argument before the selbri fills x_1; arguments after the selbri fill x_2, x_3, in order.

> **mi prami do**
>
> *I love you.*

mi

I, me (x_1 of prami)

prami

... loves ...

do

you (x_2 of prami)

> **le tirxu cu klama le barda tcadu**
>
> *The tiger goes to the big city.*

/ le tirxu:

the tiger (x_1 of klama)

klama

... goes to ...

/ le barda tcadu:

the big city (x_2 of klama — destination)

> **mi tavla do**
>
> *I talk to you.*

> **la .teris. cu citka**
>
> *Terry eats.*

/ la .teris.:

the one named Terry

When you leave a slot unfilled at the end of a sentence, it is treated as "unspecified" — the listener infers from context. So **la .teris. cu citka** just means Terry eats (something unspecified).

The cu Separator

The particle **cu** separates the last *sumti* before the *selbri* from the *selbri* itself. It has no meaning on its own — it just marks where the relation begins.

> **mi tavla do**
>
> *I talk to you.*
>
> (cu optional here — no ambiguity)

> **le sutra prenu cu tavla**
>
> *The fast person talks.*

sutra

: ... is fast

prenu

: ... is a person

Without **cu** in that last example, **le sutra prenu tavla** would be parsed as "the fast-person-type-of talker" — a description, not a sentence. The **cu** signals: "what follows is the relation, not more description".

The rule: **cu** is needed whenever a description *sumti* (**le...**) ends right before the *selbri* and the parser might otherwise absorb the *selbri* into the description.

In practice, beginners can start most sentences with **mi** or **do** or **la .name.** and omit **cu** freely — it only becomes essential in more complex sentences. You'll develop a feel for when it's needed.

Basic Sumti: Pronouns

A handful of particles work directly as *sumti* (arguments) without needing a relation word:

Lojban	Meaning
mi	I / me / we (speaker)
do	you (listener)
ti	this (thing being pointed at, nearby)
ta	that (thing being pointed at, nearby-ish)
tu	that (thing far away)
zo'e	something unspecified / obvious from context

mi and **do** do not distinguish singular from plural or any gender — that information can be added later if needed, but is not required.

zo'e is Lojban's "placeholder" — it explicitly says "there is some value here but I'm not saying what it is". Trailing **zo'e** slots at the end of a sentence can simply be omitted.

More than one *sumti* before the *selbri*

You can place **more than one** *sumti* before **cu** + *selbri*. The **place numbers stay fixed** — you are only choosing how many arguments sit in the "before the relation" zone, often for **emphasis** or style (the same *bridi* can be said several equivalent ways).

vecnu: x_1 is a seller, x_2 is goods sold, x_3 is a buyer, x_4 is a price.

> **mi cu vecnu ti ta zo'e**
>
> *I sell this to that (price left unspecified).*

> **mi ti cu vecnu ta**
>
> *I — this — sell to that.*
>
> (same claim: x_1 **mi**, x_2 **ti**, x_3 **ta**)

> **mi ti ta cu vecnu**
>
> *I — this — to that — sell.*

More than one *sumti* before the *selbri*

(same claim again)

The examples above cover the same *sumti*-order moves.

Names as Sumti

Personal names and proper nouns are preceded by **la**:

la .alis. cu tavla

Alice talks.

la .teris. cu klama le barda tcadu

Terry comes to the big city.

Names end in a consonant and are surrounded by pause marks. The pause before a name with **la** is usually written as the period that's part of the name itself.

coi .alis.

Hello, Alice!

coi la .teris.

Hello, Terry!

Names can be Lojbanized versions of names from any language. The Lojban name for a person named "John" might be **.djan.**, for "Mary" **.meris.**, and so on. The rules for forming valid Lojban names are in Chapter 14.

The Observative

If you start a sentence directly with the selbri — no x_1 before it — you get an **observative**: a quick announcement of something noticed.

klama

Someone/something is going!

(or:

Coming!

)

gerku

Dog!

(upon seeing one)

Observatives are the Lojban equivalent of English shouts like "Fire!" or "Car!" — they announce the relationship without specifying who is involved. They cannot use **cu** (there's nothing to separate).

Sentence Separators

Multiple sentences are linked by **.i** (a standalone particle):

mi prami do .i do prami mi

I love you. You love me.

.i is like a period/full stop that is also spoken aloud. It prevents the beginning of the next sentence from being mistakenly parsed as a trailing argument of the previous one.

For paragraph breaks (a new topic), use **ni'o**:

ni'o la .teris. cu blabi tirxu

[New topic:] Terry is a white tiger.

Compound Relations: tanru

When two relation words appear side by side as the *selbri*, the first **modifies** the second. The combination is called a *tanru*.

sutra tavla

fast talker

(x_1 is a fast type-of talker to x_2 about x_3 in language x_4)

> **barda tcadu**
>
> *big city*

> **blabi gerku**
>
> *white dog*

The place structure of a tanru is always that of the **rightmost** word. The modifying word adds a flavor of meaning — exactly what flavor is deliberately left vague and context-dependent, just as English compounds like "lemon tree" or "stone wall" are understood from context.

Three or more words chain the same way: each new word on the left modifies everything to its right:

> **sutra tavla gerku**
>
> *fast-talker type of dog*
>
> (a dog in the way that a fast talker is)

Tanru are very common in Lojban and an expressive and creative tool. Their vagueness is intentional — when you need precision, you use other constructions (covered in Chapter 14).

Descriptions: le … (ku)

To refer to a specific person or thing, wrap a selbri (or tanru) in **le … ku**:

> **le gerku**
>
> *the dog*
>
> (literally: "that which I describe as a dog")

> **le sutra tavla**
>
> *the fast talker*

> **le barda tcadu**
>
> *the big city*

The **ku** at the end is often omitted when the description comes at the end of a sentence or when the boundary is clear from context.

le is a descriptor — it says "I have a specific thing(s) in mind that I'm describing as …". The description is the speaker's framing, not necessarily a verified fact (the dog might be debatable, but the speaker is thinking of it that way).

You can use any relation or tanru after **le**:

> **le prami be mi**
>
> *the one who loves me*
>
> (be attaches x_2 inside the description — covered in Chapter 11)

Describing the Past and Future (Preview)

Lojban *bridi* are **tenseless by default** — the time is inferred from context. But you can add a tense particle before the *selbri*:

> **mi pu klama le zarci**
>
> *I went to the store.*
>
> (pu = past)

> **mi ca tavla do**
>
> *I am now talking to you.*
>
> (ca = present/now)

> **mi ba klama**
>
> *I will go.*
>
> (ba = future)

pu
: (particle) past tense

ca
: (particle) present / now

ba
: (particle) future tense

Tense is always optional in Lojban — omitting it does not make the sentence ungrammatical, just temporally vague.

A Starter Vocabulary

Here are some useful relation words to get you started. Each entry shows the full place structure.

People & actions

prami

x_1 loves x_2

tavla

x_1 talks to x_2 about x_3 in language x_4

klama

x_1 goes to x_2 from x_3 via x_4 by means x_5

citka

x_1 eats x_2

sipna

x_1 sleeps/is asleep

cliva

x_1 leaves x_2

vecnu

x_1 sells x_2 to x_3 for price x_4

Properties

melbi

x_1 is beautiful/pretty to x_2 by standard x_3

barda

x_1 is big/large in dimension x_2 by standard x_3

cmalu

x_1 is small/little in dimension x_2 by standard x_3

sutra

x_1 is fast/quick at doing x_2

blari'o

x_1 is blue-green (cyan/teal) of shade x_2

pluka

x_1 is pleasant/pleasing to x_2 under conditions x_3

Things

zarci

x_1 is a market/store selling x_2 run by x_3

tcadu

x_1 is a city/town of x_2

gerku

x_1 is a dog of breed x_2

tirxu

x_1 is a tiger of species x_2

A Short Dialogue

Here is a short Lojban exchange using what you now know:

> **coi .alis.**
>
> *Hello, Alice.*

> **coi .djan. .i do mo**
>
> *Hello, John. What's up?*
>
> (mo = what relation? — a selbri question)

> **mi klama le zarci .i xu do klama**
>
> *I'm going to the store. Are you going?*
>
> (xu = yes/no question marker)

> **je'u go'i**
>
> *Yes*
>
> (literally: "truly [that]")

je'u

indeed, truly (an evidential attitudinal)

go'i

[repeat the previous bridi / yes]

Terminology at a glance

Quick definitions you will see in every chapter (full detail unfolds as you read):

Term	Meaning
bridi	A claim / predication: a selbri plus filled places.
sumti	An argument — fills a place of the selbri.
selbri	The relation part of the bridi (often a **brivla** or **tanru**).
brivla	A content word with a place structure (**gismu**, **lujvo**, **fu'ivla**).
cmavo	A structural "particle" (short function word).
cmevla	A name word (ends in a consonant; pauses in writing).
gadri	A descriptor such as **le**, **lo**, **la** — starts many **descriptions**.

For how **sumti** divide into description / pro-sumti / name / quotation / number, see Chapter 3.

Summary

- **Terminology table:** bridi, sumti, selbri, brivla, cmavo, cmevla, gadri — see **Terminology at a glance** above; five sumti kinds in Ch.3
- A Lojban sentence (*bridi*) = a *selbri* (relation) + *sumti* (arguments filling numbered slots x_1 x_2 ...)
- Default word order: x_1 first, then *selbri*, then x_2 x_3 ...
- More than one sumti may appear before **cu** + selbri (same places — style/emphasis) — see **vecnu** examples above
- **cu** separates a preceding description from the selbri when needed
- Pronouns: **mi** (I), **do** (you), **ti/ta/tu** (this/that)
- Names: **la .name.** — always end in a consonant, surrounded by pause marks
- Descriptions: **le** *selbri* — "the thing I describe as ..."
- *Tanru*: two relation words side by side — first modifies second; place structure from rightmost
- Tense is optional: **pu** (past), **ca** (now), **ba** (future)
- Multiple sentences: separated by **.i**
- *Brivla* subtypes: *gismu* (root words), *lujvo* (compounds), *fu'ivla* (borrowings) — all grammatically identical
- Conversions **se/te/ve/xe**: swap x_1 with x_2/x_3/x_4/x_5 (Lojban's passive construction)

Chapter 3. Describing Things

Two Ways to Say "The"

In Chapter 2 you learned **le** as the basic way to refer to a specific thing. Lojban actually has two common descriptors, and understanding the difference between them is important:

/ **le** — "the one I describe as ...":

Refers to something the speaker has specifically in mind. The description is the speaker's own framing and doesn't have to be objectively true. **le** is like English *the* — you use it when you and the listener both know (or can figure out) what you're talking about.

/ **lo** — "something that actually is a ...":

Refers to one or more things that genuinely fit the description — things that would make a true *bridi* with that relation as *selbri*. **lo** is like English *a/an* or *some* — you use it for real instances without singling out which ones.

Compare:

> **le gerku cu melbi**
>
> *The dog is beautiful.*
>
> (I have a specific dog in mind)

> **lo gerku cu melbi**
>
> *A dog is beautiful.*
>
> /
>
> *Some dog(s) are beautiful.*
>
> (genuine dogs, which ones not specified)

> **le nanmu cu ninmu**
>
> *The man is a woman.*
>
> (grammatically fine — maybe I was wrong about the gender; **le** only says I'm describing them as a man, not that they really are one)

> **lo nanmu cu ninmu**
>
> *Some man is a woman.*
>
> (this would have to be factually true to assert)

The practical upshot: use **le** for things you're pointing at or have talked about before; use **lo** for things in general or when you're introducing something new without specifying which individual.

The five kinds of simple *sumti*

Reference grammars anchor vocabulary by sorting **sumti** (arguments) into a few **simple** shapes. Everything in this chapter is mostly about kind **1**; the others are named here so you can place what you already know.

#	Kind	Typical shape	Where it is covered
1	**Descriptions**	**le** / **lo** / **la** + *selbri* (+ optional pieces)	This chapter; relative clauses in Ch.11
2	**Pro-sumti**	**mi**, **do**, **ti**, **ko'a**, …	Chapter 5
3	**Names**	**la** + *cmevla* (or **la** + *selbri* nickname)	Chapter 5; **la** + *selbri* below in this chapter
4	**Quotations**	**lu … li'u**, **zo**, **zoi**, **lo'u … le'u**, …	Chapter 17
5	**Numbers as sumti**	**li** … (mekso)	Chapter 18

> **mi klama le zarci**
>
> *I go to the store.*
>
> — **mi** (pro-sumti) + **le zarci** (description).

Complex *sumti* add **relative clauses**, **sumti qualifiers** (**la'e**, **tu'a**, …), **abstractions**, and more — they still sit in the same argument slots; the subsequent sections of Chapter 3, Chapter 11 (relative clauses), and Chapter 12 (abstractions) cover each type.

Numbers Before Descriptions

You can place a number directly before **le** or **lo** to say how many things you mean:

> **pa le gerku cu blabi**
>
> *One of the dogs is white.*

> **re lo prenu cu klama**
>
> *Two people come.*

> **ci le mlatu cu sipna**
>
> *Three of the cats are sleeping.*

Basic numbers:

Lojban	Meaning
no	zero
pa	one
re	two
ci	three
vo	four
mu	five
xa	six
ze	seven
bi	eight
so	nine

Numbers in Lojban must be exact. If you say **re le gerku**, you are claiming exactly two dogs, not "about two" or "at least two". To say "at least", use **su'o**:

> **mi ponse su'o re cutci**
>
> *I own at least two shoes.*

To say "all", use **ro**:

> **ro le gerku cu blabi**
>
> *All of the dogs are white.*

ro
: all / every

su'o
: at least one / some

These two — **ro** and **su'o** — are Lojban's fundamental quantifiers. More on quantification in Chapter 13.

Inner Quantifiers: Saying How Many There Are

A quantifier placed *inside* a description (between the descriptor and the relation word) declares the total number of things in the group — not how many you're talking about this time.

> **re le ci gerku cu blabi**

> *Two of the three dogs are white.*

/ le ci gerku:

the three dogs (inner quantifier ci: there are exactly three)

/ re le ci gerku:

two of those three (outer quantifier re: we're asserting something about two of them)

In plain conversation, inner quantifiers are used mainly with **le** when you want to be precise about the size of the group you have in mind. Most of the time you can omit them and let context fill in.

Full inner/outer interaction rules:

The outer quantifier picks a *subset* of the group named by the inner quantifier:

> **su'o re le ci gerku cu blabi**
>
> *At least two of the three dogs are white.*

The outer **su'o re** picks at least two members; the inner **ci** defines the total pool as three.

There is a subtle difference between **le** and **lo** inner quantifiers:

- For **le**, the inner quantifier reflects the speaker's *framing* — **le ci nanmu** means "what I describe as three men." It need not be objectively true. The speaker claims there are three.
- For **lo**, the inner quantifier is always *veridical* — **lo ci gerku** claims there genuinely are exactly three dogs in the domain.

Full default quantifier table for all 11 descriptors:

The pattern extends to the whole family of Lojban descriptors. Masses (**lei/loi/lai**) and sets (**le'i/lo'i/la'i**) use fractional quantifiers **piro** ("the whole of") and **pisu'o** ("some part of") because a mass or set is a single collective object — it doesn't make sense to count two distinct masses of the same members.

Descriptor	Full implicit form	Read as
le	**ro le su'o**	all of the (at least one) described-as…
lo	**su'o lo ro**	at least one of all actual…
la	**ro la su'o**	all of the at-least-one named…
lei	**pisu'o lei su'o**	some part of the mass of (at least one) described-as…
loi	**pisu'o loi ro**	some part of the mass of all actual…
lai	**pisu'o lai su'o**	some part of the mass of at-least-one named…
le'i	**piro le'i su'o**	the whole set of (at least one) described-as…
lo'i	**piro lo'i ro**	the whole set of all actual…
la'i	**piro la'i su'o**	the whole set of at-least-one named…
le'e	**ro le'e su'o**	all the stereotypes of (at least one) described-as…
lo'e	**su'o lo'e ro**	at least one of the types of all actual…

Why piro for sets, pisu'o for masses? A set is one object — you always refer to the whole set or a definite subset. A mass is also one collective object, but you typically act on *some part* of it (drinking from a glass of water, eating from a loaf of bread).

piro and **pisu'o** are fractional quantifiers: **pi** is the decimal point, so **piro** = "the entirety" and **pisu'o** = "at least some portion."

> **pisu'o loi djacu cu blanu**
>
> *Some of the water (mass) is blue.*

> **piro le'i prenu cu nanmu**
>
> *The entire set of people (I have in mind) consists of men.*

So **le gerku** = **su'o le ro gerku** = "at least one of all the dogs I have in mind."

The Typical: lo'e and le'e

Two special descriptors let you talk about a *typical* member of a category rather than a specific one.

/ **lo'e** — "the typical ..." (objective typical):

Refers to an imaginary representative that best exemplifies what that kind of thing is really like.

> **lo'e cinfo cu xabju le fi'ortu'a**
>
> *The (typical) lion lives in Africa.*

This says something true about lions as a kind — not that every individual lion lives in Africa, but that it's characteristic. You're describing the idealized lion, not any particular one.

/ **le'e** — "the stereotypical ..." (subjective typical):

Like **lo'e** but based on the speaker's mental image, which may be culturally specific or even a stereotype.

> **le'e mlatu cu nelci le finpe**
>
> *The stereotypical cat likes fish.*

lo'e and le'e are useful for making generic statements — "dogs are loyal", "students are busy" — without committing to claims about every individual.

lo'e vs le'e — the key distinction:

- **lo'e gerku** = the objectively typical dog — the ideal representative as defined by the biology and nature of dogs.
- **le'e gerku** = the stereotypical dog as the *speaker* (or community) conceives it — which may reflect cultural assumptions rather than objective fact.

lo'e gerku cu batci

Dogs (typically/objectively) bite.

— true of dogs as a species

le'e gerku cu pendo

Stereotypically, dogs are friendly.

— a common belief, but not universally true

Neither **lo'e** nor **le'e** refers to any specific individual. Their implicit count is effectively **pa** (one ideal/stereotype). You cannot meaningfully say "two typical dogs" — there is only one ideal.

Tanru Grouping with bo

In Chapter 2 you learned that putting two relation words side by side creates a *tanru* where the first modifies the second. When you add a third word, Lojban's default is **left-grouping**: the leftmost two bind first.

cmalu nixli ckule = **(cmalu nixli) ckule** — "a (small girl)-type school" = a school for small girls

To group differently, use **bo** to bind the two words to its *right* most tightly:

cmalu nixli bo ckule = **cmalu (nixli ckule)** — "a small (girl-school)" = a small school for girls

bo always signals: "bind me to what comes directly after me".

Compare:

la .teris. cu barda melbi tirxu

Terry is a (big-beautiful)-type tiger.

(big beauty modifies tiger)

la .teris. cu barda melbi bo tirxu

Terry is a big (beautiful-tiger).

(beautiful tiger modifies the whole; Terry is a big beautiful-tiger)

A useful way to think about it: without **bo**, groups build from left; with **bo**, the bo-pair is the tightest bond.

Grouping with ke ... ke'e

For longer or more complex *tanru*, **ke** and **ke'e** work like parentheses: everything between **ke** and **ke'e** is treated as a single *tanru* component.

> **ta ke melbi cmalu ke'e nixli ckule**
>
> *That is a ((beautiful small) girl) school.*
>
> = a school for beautifully small girls

> **ta melbi ke cmalu nixli ke'e ckule**
>
> *That is a (beautiful) (small girl) school.*
>
> = a beautifully-small girls' school

ke'e can be omitted at the end of the *selbri* if there's no ambiguity:

> **ta melbi ke cmalu nixli ckule** (same meaning, ke'e dropped at end)

As a beginner you can get by with **bo** for most grouping needs. **ke...ke'e** is for when you need precise three-way or four-way distinctions.

Masses: lei and loi

So far, **le** and **lo** treat their referents as individuals — even if there are multiple, each one individually satisfies the *bridi*.

> **le prenu cu bevri le pipno**
>
> *The person(s) carry the piano.*
>
> — each person, individually, carries it

But sometimes things only work together. Two people might together carry a piano, even though neither could alone. For this, Lojban has **mass** descriptors:

/ **lei** — "the mass of those I describe as ...":

Like **le** but treats the group as a single collective unit.

> **lei prenu cu bevri le pipno**
>
> *The people (as a group) carry the piano.*
>
> — they carry it together

/ **loi** — "some of the mass of those that really are ...":

Like **lo** but mass.

> **loi cinfo cu xabju le fi'ortu'a**
>
> *Lions (as a kind) live in Africa.*
>
> (some part of the mass of all lions)

Masses inherit the properties of their members. A mass of people carrying a piano collectively is doing what individuals together accomplish. A mass of tall and short people can be both tall and short — which is why mass reasoning isn't ordinary logic.

For most everyday sentences you'll use **le** and **lo**. Masses become important when talking about collective actions or generic truths about a kind.

Sets: le'i and lo'i

Sets are the third kind: a collection considered as a mathematical object.

le'i — "the set of those I describe as ..."

lo'i — "the set of those that really are ..."

> **lo'i gerku cu barda**
>
> *The set of all dogs is large.*
>
> (it has many members)

Sets have properties like size and membership, but don't inherit the properties of their members. The set of dogs is not brown, even though some dogs are. Sets are used mainly with predicates that explicitly require a set in their place structure — most everyday talk uses **le** and **lo** instead.

A Vocabulary Snapshot: Common Properties

Here are some useful property words (relation words whose x_1 is the thing having that property):

blabi

x_1 is white

xekri

x_1 is black

pelxu

x_1 is yellow

crino

x_1 is green

blanu

x_1 is blue

xunre

x_1 is red

barda

x_1 is big/large

cmalu

x_1 is small/little

clani

x_1 is long/tall

tordu

x_1 is short

melbi

x_1 is beautiful/attractive to x_2 by standard x_3

pluka

x_1 is pleasing/pleasant to x_2 under conditions x_3

xlali

x_1 is bad/undesirable by standard x_2

Any of these can form a *tanru* with a noun-like relation word:

> **le blabi mlatu**
>
> *the white cat*

> **lo barda tcadu**
>
> *a big city*

> **le melbi nixli**

> *the beautiful girl*

Examples from Real Lojban

> **le pa tirxu be me'e zo .teris. pu ki kansa le za'u pendo**
>
> *The one tiger named Terry used to live together with the many friends.*

(From *Terry the Tiger Visits the Big City* — showing **le pa tirxu** with inner quantifier **pa** and name label **me'e zo .teris.**)

> **la .teris. co'a cadzu klama le bi'unai barda tcadu**
>
> *Terry started walking to the (already-mentioned) big city.*

(The *tanru* **barda tcadu** = "big city" is used naturally throughout the story.)

Sumti Qualifiers: Shifting What a Sumti Means

Sometimes you want to talk about something *associated with* a *sumti* rather than the *sumti* itself. Lojban provides **sumti qualifiers** that wrap around any *sumti* and shift its reference:

/ **la'e** — "the referent of":

Takes a description or name and refers to what it points to, not the description itself.

> **la'e di'u cu jitfa**
>
> *The referent of the previous sentence is false.*
>
> → What was described is false.

/ **lu'e** — "a symbol/name for":

The reverse of **la'e** — takes something and refers to a symbol for it.

> **lu'e la .djan. cu se cusku mi**
>
> *I said a name for John.*
>
> (= I said "John" or something referring to him)

/ **tu'a** — "something associated with" (vague):

A loose *sumti*-raiser — refers to some event or fact related to the *sumti*.

> **mi djica tu'a le plise**
>
> *I want something about/involving the apple.*
>
> (want to eat it? own it? — vague)

tu'a is a shorthand for "some event or property related to [X]". It's common when the full abstraction would be tedious:

> **mi djica tu'a do** =
>
> *I want something from you*
>
> /
>
> *I want you to do something.*

When you need to be precise, replace **tu'a** with an explicit abstraction (**le nu ...**, **le du'u ...**, **le ka ...**) that names the event or claim you mean.

The most practical qualifier is **la'e**:

> **mi nelci la'e le cukta**
>
> *I like what the book is about.*
>
> (not just the physical book)

> **mi ctuca la'e le cusku be do**
>
> *I teach what you said.*
>
> (the content, not the utterance)

Indefinite Descriptions and zo'e

Lojban's most "implicit" *sumti* are the *indefinite* ones — *sumti* that exist but don't need to be named:

/ **zo'e** — "something real but unspecified":

Explicitly fills a slot with an unspecified value. Trailing **zo'e** slots can be omitted; inner slots need the word.

> **mi klama le zarci zo'e le karce**

> *I go to the store via [unspecified] by car.*

/ **zi'o** — "doesn't exist / this place doesn't apply":

Eliminates a place entirely from the predicate. The resulting predicate doesn't have that slot.

> **mi dunda le cukta zi'o**
>
> *I give the book.*
>
> (no recipient — **zi'o** removes x_3 rather than leaving it vague)

Compare:

> **mi dunda le cukta zo'e** — I give the book to someone (unknown) **mi dunda le cukta zi'o** — I give the book (giving without a recipient is meaningful)

/ **su'o** — "at least one" as descriptor:

su'o le gerku = "at least one of the dogs" — more explicit than a plain **lo gerku**.

Indefinite Descriptions: Bare Number Without lo

When you write an explicit outer quantifier *without* any descriptor, Lojban allows you to drop **lo**:

> **re gerku cu batci mi**
>
> *Two dogs bite me.*
>
> (= **re lo gerku cu batci mi**)

This only works when there is no inner quantifier — just a plain number followed directly by the *brivla*. The meaning is always **lo**-like (genuine instances, veridical). This shorthand is common in spoken Lojban. You cannot drop **le** this way — bare numbers always imply **lo**.

> **ci prenu cu klama** =
>
> *Three people come.*
>
> (at least three genuine people)

Sumti-based Descriptions

A **sumti-based description** is one where a *sumti* appears *in the slot normally filled by a* selbri. The inner quantifier is required and must be explicit.

The most common case: describe a *subset of a group you are already talking to or about.*

> **re do cu nanmu**
>
> *Two of you are men.*
>
> (of the listeners, size unknown, two are men)

> **le re do cu nanmu**
>
> *The two of you are men.*
>
> (I have a group of two listeners specifically in mind; all of them are men)

In **le re do**, the inner quantifier **re** gives the *size* of the group the inner *sumti* **do** refers to. The implicit outer **ro** then says "all of those two."

Nesting is possible:

> **re le ci cribe cu bunre**
>
> *Two of the three bears are brown.*

> **le re le ci cribe cu bunre**
>
> *The two-of-the-three bears are brown.*
>
> (a specific pair from that group of three)

> **pa le re le ci cribe cu bunre**
>
> *One of the two-of-the-three bears is brown.*
>
> (one specific bear from a specific pair from the original three)

Each layer of **le** + inner quantifier narrows the group further. This construction is rarely needed in everyday speech, but appears in formal or careful writing when precise reference is required.

Possessive Sumti as Internal pe Relative Phrase This is actually a hidden pe relative phrase:

> **le mi karce** = **le karce pe mi** =
>
> *the car associated with me*

Any *sumti* placed between a descriptor and its *selbri* works exactly like a **pe**-phrase. All the scoping and attachment rules for **pe** apply. This means:

> **le do ckule** = **le ckule pe do** =
>
> *your school*

> **le pa nanmu nixli** = **le nixli pe le pa nanmu** =
>
> *the girl of the one man*

The possessive-as-internal construction is purely a notational convenience. For precise relative clauses or complex possession, use explicit **pe/po/po'e/po'u**.

---

la + *selbri*: Names from Relation Words

la can be followed not just by a proper name but by any *selbri*:

> **la gerku** = "the one(s) called 'gerku'" / "the one(s) named Dog"

This refers to something that has been *given the name* **gerku**, not to an actual dog. It is quite different from **lo gerku** (genuine dogs) or **le gerku** (things I describe as dogs):

form	meaning
la .djan.	the one(s) named John
la gerku	the one(s) named Dog/gerku
lo gerku	actual dogs
le gerku	what I describe as dogs

The implicit outer quantifier for **la** + *selbri* is **su'o** (at least one), just like **la** + proper name. This usage is common for giving descriptive nicknames or referring to characters in stories by their role names.

Quotations and numbers (full chapters)

Simple-*sumti* kinds **4** (quotations) and **5** (**li** / mekso) are only **named** early in this chapter; the teaching lives where they are used most:

- **Quotations** — **lu … li'u**, **zo**, **zoi**, **lo'u … le'u**, **la'o**, …: Chapter 17 — Text Structure & Quotation.
- **Numbers and mathematical expressions** — **PA**, **li**, operators: Chapter 18 — Letters, Numbers & Math.

Names and **pro-sumti** are in Chapter 5; **descriptions** are the bulk of *this* chapter. Together these replace CLL's single end-of-chapter "quotation / number" boxes — same content, friendlier pacing.

Summary

- **Five kinds of simple *sumti*:** descriptions (**le**/…), pro-*sumti*, names, quotations, **li**-numbers — see table at the start of this chapter
- **Quotations & numbers:** full lessons in Ch.17 and Ch.18 (see **Quotations and numbers** above)
- **le** = "the … I have in mind" (specific, speaker's framing)
- **lo** = "some actual …" (genuine instances, non-specific)
- Number before descriptor = outer quantifier (how many we're talking about)
- Number inside descriptor = inner quantifier (how many there are total)
- **ro** = all; **su'o** = at least one
- **lo'e** = the typical …; **le'e** = the stereotypical …
- Tanru grouping: default is left; **bo** tightens its right neighbor; **ke … ke'e** are parentheses
- **lei/loi** = mass descriptors (collective); **le'i/lo'i** = set descriptors (mathematical)
- **la'e** = the referent of (shifts from symbol to thing)
- **lu'e** = a symbol for (shifts from thing to symbol)
- **tu'a** = something related to (vague *sumti*-raiser; paraphrase with **nu**/**du'u**/**ka** when precision matters)
- **zi'o** = this place doesn't apply (removes a slot)
- Bare number without descriptor (e.g. **re gerku**) = shorthand for **re lo gerku** (veridical, no **le** equivalent)
- **le mi karce** = **le karce pe mi** — internal *sumti* between descriptor and *selbri* is a hidden **pe** phrase
- **lo'e** = objective typical (nature); **le'e** = subjective stereotypical (speaker's image); both count as **pa** (one ideal)
- **la gerku** = the one(s) *named* gerku — distinct from **lo gerku** (actual dogs)
- Inner quantifier of **le** reflects speaker's framing (need not be true); inner quantifier of **lo** is veridical
- Full default quantifier table covers all 11 descriptors; masses use **pisu'o**, sets use **piro**
- **Sumti-based descriptions** (**le re do**, **le re le ci cribe**): *sumti* fills the selbri slot; inner quantifier required

Chapter 4. Rearranging & Tagging Places

Motivation

In the default Lojban word order, x_1 comes before the *selbri* and the rest follow in numbered order. This works perfectly for simple sentences. But what if you want to:

- Omit a middle place while filling a later one?
- Put Boston first in the sentence for emphasis?

⚙️ Make it crystal clear which slot a long, complex argument fills?

Lojban has two tools for this: **FA place tags** and **SE conversion**.

FA Place Tags

The five particles **fa fe fi fo fu** explicitly label which place a following *sumti* fills.

Tag	Place
fa	x_1
fe	x_2
fi	x_3
fo	x_4
fu	x_5

Place any of these immediately before a *sumti* to declare its slot, regardless of position in the sentence.

> **mi cu klama la bastn. la .atlantas. zo'e le karce**
>
> *I go to Boston from Atlanta via (unspecified) by car.*

Using FA tags, this can be rewritten with any order:

> **fu le karce fo zo'e fi la .atlantas. fe la bastn. fa mi klama**
>
> *x_5=the car x_4=unspecified x_3=Atlanta x_2=Boston x_1=I — go*

Both sentences mean the same thing.

FA tags shine when you need to **skip a middle place** without using **zo'e**:

> **mi klama la bastn. la .atlantas. zo'e le karce**
>
> *I go to Boston from Atlanta via (?) by car.*
>
> — zo'e fills x_4

> **mi klama fe la bastn. fi la .atlantas. fu le karce**
>
> *I go x_2=Boston x_3=Atlanta x_5=car*
>
> — x_4 (route) is simply absent

> **klama fi la .atlantas. fe la bastn.**
>
> *A-goer x_3=Atlanta x_2=Boston*
>
> — x_1 empty (observative style), x_2 and x_3 in reverse order

After a tagged *sumti*, any subsequent *untagged sumti* fill the slots that immediately follow the tagged one in numerical order (skipping already-filled slots). So you can tag just one problematic *sumti* and let the rest flow naturally:

> **mi klama fi la .atlantas. la bastn. le dargu le karce** — fa=mi (x_1, before
>
> *selbri*
>
>), fi=la .atlantas. (x_3), then la bastn. fills x_2? No —

Actually: after the **fi** tag, untagged *sumti* fill x_4, x_5 in order (skipping x_2 and x_3 already handled). So:

> **mi klama la bastn. fi la .atlantas.**
>
> *I go to-Boston x_3=from-Atlanta*

Here x_1=mi, x_2=la bastn. (naturally second after *selbri*), x_3=la .atlantas. (tagged), x_4 and x_5 empty.

fi'a: The Place-Structure Question

fi'a is a special FA particle that *asks* which place a *sumti* occupies:

> **fi'a do dunda le vi rozgu**
>
> *In what role are you involved in the giving of this rose?*

The listener can reply with a bare FA particle: **fa** (you are the giver) or **fi** (you are the recipient).

SE Conversion

FA tags move arguments around. **SE conversion** goes deeper: it actually *restructures the* selbri *itself*, swapping x_1 with another place to produce a new relation word with a new place structure.

Particle	Effect
se	swap x_1 and x_2
te	swap x_1 and x_3
ve	swap x_1 and x_4
xe	swap x_1 and x_5

The result is a new *selbri* that is placed before the original verb. The new x_1 is whatever was x_2 (or x_3, etc.) of the original.

klama place structure: x_1 goes to x_2 from x_3 via x_4 by x_5

se klama place structure ($x_1 \leftrightarrow x_2$): x_1 is the destination; x_2 is the traveler; x_3=origin, x_4=route, x_5=means

> **la bastn. cu se klama mi**
>
> *Boston is gone-to by me.*
>
> (Boston is the destination of my going)

This is the Lojban equivalent of the passive voice. It says the same underlying fact as **mi klama la bastn.** but promotes Boston to x_1.

te klama ($x_1 \leftrightarrow x_3$): x_1 is the origin; x_2 is the destination; x_3 is the traveler

> **la .atlantas. cu te klama mi la bastn.**
>
> *Atlanta is the origin of my going to Boston.*

ve klama ($x_1 \leftrightarrow x_4$): x_1 is the route; x_2=destination, x_3=origin, x_4=traveler

> **le dargu cu ve klama mi la bastn.**
>
> *The road is the route of my going to Boston.*

SE in Descriptions

SE conversion becomes especially useful when building descriptions with **le**. Recall that **le selbri** takes the x_1 of the *selbri* as the thing described:

> **le klama** —
>
> *the goer*
>
> (x_1 of klama = the traveler)

le se klama —

the destination

(x_1 of se klama = the place gone to)

le te klama —

the origin

(x_1 of te klama = the place gone from)

le ve klama —

the route

(x_1 of ve klama = the path taken)

le xe klama —

the means

(x_1 of xe klama = the vehicle/method)

This is powerful: from a single five-place relation, you get five description types — traveler, destination, origin, route, means — by just prefixing the right SE.

More examples with **dunda** (x_1 gives x_2 to x_3):

le dunda —

the giver

le se dunda —

the gift

(x_2 of dunda)

le te dunda —

the recipient

(x_3 of dunda)

And with **tavla** (x_1 talks to x_2 about x_3 in language x_4):

le se tavla —

the listener / audience

le te tavla —

the topic of discussion

le ve tavla —

the language used

Multiple SE

You can stack two SE particles, but they are evaluated left to right:

se te klama

First apply **se** (swap $x_1 \leftrightarrow x_2$): x_1=destination, x_2=traveler, x_3=origin Then apply **te** (swap $x_1 \leftrightarrow x_3$ of the already-converted result): x_1=origin, x_3=destination

In practice, stacked SE is rarely used because FA tags or a single well-chosen SE usually suffice.

---

jai: Converting a Modal Tag into x_1

jai followed by a modal tag (BAI or **fi'o** phrase) converts the *selbri* so that the *modal argument* becomes x_1 of the new *selbri*. The original x_1 is demoted to the special place **fai**:

le vorme jai co'a kalri

The door [x_1 = door] begins-to-open.

(intransitive; door is the mover)

mi jai gau klama

I am the agent of going.

(= I cause going to happen; **gau** fills x_1 with the agent)

The structure: **jai gau klama** means "is an agent of going" — x_1 of the converted *selbri* is the agent (**gau** = gasnu = agent). The original x_1 of **klama** (the goer) moves to **fai** if needed:

mi jai gau klama fai le bende

I cause the team to go.

(mi = agent in x_1; le bende = original x_1 of klama, now in fai)

jai with any modal tag:

Expression	Meaning of x_1
jai gau klama	the agent of going
jai ri'a klama	the physical cause of going
jai mu'i klama	the motive for going
jai zu'e klama	the purpose-actor of going
jai fi'o kanla viska	the eye used for seeing

SE conversion of jai-*selbri* is also valid:

le bende cu se jai gau klama mi

The team is caused-to-go by me.

(se moves the fai argument back to x_1)

This is how Lojban handles causative alternations cleanly without changing the base *selbri*.

Word Order and Emphasis

Both FA tags and SE conversion change *which* argument is in the x_1 slot — the grammatical "topic" position. In Lojban, information moved out of its default position carries extra emphasis.

Standard order (neutral):

mi tavla do

I talk to you.

Emphasizing the listener (fe brings x_2 forward, or se promotes it):

> **do cu se tavla mi**
>
> *You are talked-to by me.*
>
> (emphasis: you are the one being talked to)

Emphasizing the *selbri* (observative, no x_1):

> **tavla mi do**
>
> *There's talking going on — I'm talking to you!*

---

zo'e: The Explicit Placeholder

When you need to skip a middle place without tagging, use **zo'e** ("the unspecified/obvious thing"):

> **mi klama la bastn. la .atlantas. zo'e le karce**
>
> *I go to Boston from Atlanta via (unspecified route) by car.*

zo'e doesn't claim there is *no* value — it says the value is real but either obvious from context or not relevant to state. You can use **zo'e** in any place, in any position.

Summary

- **fa fe fi fo fu** tag *sumti* to specific places x_1–x_5, freeing word order
- After a tagged *sumti*, untagged *sumti* fill the next numerically available places
- **fi'a** asks "which place?"; answered with a bare FA particle
- **se te ve xe** convert the *selbri* by swapping x_1 with x_2/x_3/x_4/x_5
- SE gives new *selbri*: **le se klama** = the destination, **le te klama** = the origin, etc.
- **zo'e** explicitly fills a place with an unspecified value
- Moving arguments out of default position adds emphasis

Chapter 5. Pronouns & Back-References

Why Lojban Needs Its Own Pronoun System

English pronouns like *he*, *she*, *it*, *they* carry implicit information about gender and number. Lojban does not use grammatical gender at all, and number is optional — so the English pronoun system doesn't map cleanly onto Lojban. Instead, Lojban has several *series* of pro-*sumti*, each organized around a specific function.

The mi-series: Personal Pronouns

The most fundamental pronouns refer to the participants in the conversation.

Lojban	Meaning
mi	I / me — the speaker (and possibly others the speaker represents)
do	you — the listener(s)
mi'o	you and I together (excludes others)
mi'a	we but not you — speaker + others, excluding listener
do'o	you and others — listener + others, excluding speaker
ma'a	we all — speaker, listener, and others
ko	you-imperative — like **do** but turns the *bridi* into a command

Neither **mi** nor **do** specifies singular or plural. A spokesperson saying "we believe ..." would use **mi** on behalf of a group.

The "we" pronoun series is more precise than English: Lojban distinguishes whether the listener is included (**mi'o** = you and I; **mi'a** = we without you). This eliminates a common ambiguity in English: "We're going to the store" — does that include you?

ko is the command particle. It can go in any *sumti* slot:

> **ko klama le zarci**
>
> *Go to the store!*
>
> (literally: make "you go to the store" true)

> **mi viska ko**
>
> *Make "I see you" true!*
>
> =
>
> *Be seen by me!*
>
> /
>
> *Show yourself!*

> **ko kurji ko**

> *Take care of yourself!*
>
> (ko in both x_1 and x_2)

The ti-series: Demonstrative Pronouns

Three pronouns refer to things pointed at in physical space:

ti
: this — something near the speaker

ta
: that — something at a medium distance (often near the listener)

tu
: that yonder — something far from both speaker and listener

> **ti melbi**
>
> *This is beautiful.*

> **mi klama tu**
>
> *I'm going to that (far-away thing).*

Note: **ti**, **ta**, **tu** are true pronouns — they replace the whole argument. To say "this boat" (the boat near me), use a tense tag, not **ti**:

> **le vi bloti** —
>
> *the nearby boat*
>
> (vi = "here")

> **ti noi bloti** —
>
> *this thing, which happens to be a boat*

The di'u-series: Utterance Pronouns

Sometimes you want to refer to something that was *said* rather than something physical. The di'u-series refers to utterances — sentences, sentences, passages of text:

Lojban	Meaning
di'u	the previous utterance
de'u	an earlier utterance
da'u	a much earlier utterance
di'e	the next utterance (upcoming)
de'e	a later utterance
da'e	a much later utterance
dei	this very utterance (the one being spoken now)
do'i	some unspecified utterance

> **do na nelci loi mlatu .i di'u jitfa**
>
> *You don't like cats. That [previous utterance] is false.*

di'u refers to the sentence as a piece of text. If you want to refer to the *situation* described (not the words themselves), use **la'e di'u** ("the referent of the previous utterance"):

> **mi prami la .djan. .i mi nelci la'e di'u**
>
> *I love John. And I like that [= the situation of my loving John].*

Contrast with:

> **mi prami la .djan. .i mi nelci di'u**
>
> *I love John. And I like [the sentence "I love John"].*
>
> — liking the sentence, not the fact

la'edi'u is often written as a single word. It's very common in Lojban text.

The ko'a-series: Assignable Pronouns

Lojban's equivalents of *he/she/it/they* are the **ko'a-series** — ten generic pronouns with no inherent reference. You assign them explicitly with **goi**.

Lojban	Gloss
ko'a	it-1
ko'e	it-2
ko'i	it-3
ko'o	it-4
ko'u	it-5
fo'a	it-6
fo'e	it-7
fo'i	it-8
fo'o	it-9
fo'u	it-10

Assigning with goi — forethought form:

> **la .alis. goi ko'a cu klama le zarci .i ko'a cu blanu**
>
> *Alice (hereafter: ko'a) goes to the store. She is blue.*

Assigning with goi — afterthought form:

> **la .alis. klama le zarci goi ko'a .i ko'a blanu**
>
> *Alice goes to the store (call her ko'a). ko'a is blue.*

Both **la .alis. goi ko'a** and **ko'a goi la .alis.** work identically — **goi** is symmetric.

Unlike English pronouns, ko'a-series pronouns carry no gender, no animacy, and no number — they refer to whatever you assigned them to. You can assign them to people, objects, places, or even abstract things like events.

The ri-series: Relative Back-References

Sometimes you want to say "the aforementioned ..." without choosing a ko'a slot. The ri-series points back to recently mentioned *sumti*:

ri
: the previous *sumti* (the most recently completed argument)

ra
: an earlier *sumti* (vague — not the one ri refers to)

ru

a much earlier *sumti* (earlier than ra's referent)

> **la .teris. cu klama le zarci .i ri blanu**
>
> *Terry goes to the store. It [= the store, the most recent sumti] is blue.*

Be careful: **ri** refers to the previous *sumti* in the text, not necessarily the subject. In the example above, **ri** is the store (last completed *sumti*) not Terry. If you want Terry:

> **la .teris. cu klama le zarci .i la .teris. cu blanu**

or assign:

> **la .teris. goi ko'a cu klama le zarci .i ko'a blanu**

ri is convenient for quick back-references; **ko'a** is for careful, unambiguous longer-range references.

Scan (parallel to the ti-series for distance): ri / ra / ru repeat *sumti* by recency; **go'i / go'a / go'u** repeat whole *main-bridi* patterns the same way (see **The go'i-series** later in this chapter).

	Nearest	Mid	Far back
Sumti	**ri**	**ra**	**ru**
Bridi	**go'i**	**go'a**	**go'u**

ri before the surrounding *sumti* is finished: ri always copies the *last complete sumti* before it — not a phrase that is still open. A useful pattern is "in someone's room":

> **la .teris. cu sipna ne'i le ri kumfa**
>
> *Terry sleeps in Terry's room.*
>
> Here **ri** = **la .teris.** (the possessor), because **le ri kumfa** is
>
> *not*
>
> yet complete when **ri** appears.

The same meaning, spelled out without **ri**:

> **la .teris. cu sipna ne'i le la .teris. kumfa**

So **ri** cannot refer to **le ri kumfa** itself — that would create a self-referential tangle. Inner *sumti* (here **la .teris.** inside the larger description) count as *more recent* than the outer phrase they sit in.

Why you still say the second mi: ri mostly *skips* **mi**, **do**, assignable **ko'a…**, **zo'e**, and **ri** itself. To say "I love myself", repeat **mi** — **ri** will *not* stand in for the second slot:

> **mi prami mi**
>
> *I love myself.*

For "x_1 of this *bridi*" in a specific place, **vo'a** is often clearer; see the section **vo'a: The Reflexive** below. This pair just shows why **ri** is not a substitute for another **mi**.

ti and **ri:** You may use **ri** after **ti** / **ta** / **tu** if you have just pointed at something new. Two **ri** in a row with nothing between them still pick the *same* antecedent:

> **la .teris. cu viska le tricu .i ri melbi**
>
> *Terry sees the tree. It [= the tree] is beautiful.*

> **la .teris. cu viska le tricu .i ri du ri**
>
> *Terry sees the tree. It is the same as itself.*
>
> (Both **ri** = **le tricu** — a deliberate "chain" of **ri**.)

Quotations: ri inside **lu … li'u** normally does **not** reach out to *sumti* in the surrounding narrative; see Chapter 17 for quotation rules and nearby-quote exceptions.

What ri counts and skips:

- **ri** counts every *completed sumti* in order of appearance — including ti/ta/tu (demonstratives), since you may have changed what you are pointing at.
- **ri** skips most KOhA *cmavo*: mi, do, ko'a-series, ko-imperatives, zo'e, and the ri/ra/ru words themselves.
- A *sumti* nested *inside* another *sumti* (e.g. inside a **le** description) counts based on its *start position*, not its container. So inner *sumti* are "more recent" than the container that wraps them.

Subscripted ri for exact targeting: When you need to skip back further than one *sumti*, use **xi** + a number:

> **lo smuci .i lo forca .i la rik. pilno ri xi re**
>
> *A spoon. A fork. Rick uses [the second-back = the fork].*

ri xi re skips one and picks up the next-to-last *sumti*; **ri xi mu** skips four and picks up the fifth-from-last. In practice this is cumbersome in speech — prefer assigning a ko'a slot for anything beyond a one-step back-reference. Older texts sometimes write **rixire** glued together; it is the same as **ri xi re**.

When subscripts are awkward, use ra: The same scene, but with a vague "some earlier thing" instead of counting:

> **lo smuci .i lo forca .i la rik. pilno ra**
>
> *A spoon. A fork. Rick uses [some previous sumti — not **la rik.**].*

Here **ra** usually means **lo forca** (the fork): the listener uses context. If even **ra** / **ru** feel fuzzy, assign once: **le forca goi ko'e .i la rik. cu pilno ko'e**.

Ordering rules for ra and ru:

- **ra** refers to a *recently used sumti* that is *not* the one **ri** would pick. If **ri** has not been used, **ra** may be the last *sumti*.
- **ru** refers to a *sumti* further back than **ra**'s referent. If both **ri** and **ra** are used, **ru** must be even older.
- A chain of consecutive **ri** (no other *sumti* between them) all refer to the *same sumti* — each **ri** takes the previous **ri**'s referent as its antecedent, which is the same underlying *sumti*.

---

vo'a: The Reflexive

To say the same thing fills two slots of the same *bridi* (like English "herself", "himself"):

vo'a

the same as x_1 of this *bridi*

vo'e

the same as x_2

vo'i

x_3; **vo'o** = x_4; **vo'u** = x_5

> **la .alis. cu prami vo'a**
>
> *Alice loves herself.*

> **mi tavla do fo vo'a**
>
> *I talk to you in (my own) language.*
>
> (vo'a = x_1 = mi)

---

zo'e: The Unspecified

zo'e is not exactly a pronoun but is worth reviewing here: it fills a place with "something real but unspecified":

> **mi citka zo'e**
>
> *I eat something (unspecified).*

Trailing **zo'e** slots at the end of a *bridi* can simply be omitted:

> **mi citka** = **mi citka zo'e** (eating something unspecified)

But when you need to skip a *middle* place while filling a later one, **zo'e** makes the skip explicit:

> **mi klama la bastn. la .atlantas. zo'e le karce**
>
> *I go to Boston from Atlanta via (unspecified route) by car.*

Names and Vocatives

Names in Lojban always end in a consonant and are surrounded by pause marks. They come after **la** when used as *sumti*:

> **la .alis. cu tavla la .djan.**
>
> *Alice talks to John.*

To address someone directly (a vocative), use a greeting particle followed by the name:

coi
: hello / greetings

co'o
: goodbye

doi
: O [address marker, no greeting implied]

> **coi .alis.**
>
> *Hello, Alice.*

> **co'o .djan.**
>
> *Goodbye, John.*

> **doi .teris. ko klama**
>
> *Hey Terry, come here!*

doi sets the value of **do** for the rest of the conversation:

> **doi la .alis. mi prami do**

> *[Addressing Alice:] I love you.*

After **doi la .alis.**, **do** refers to Alice until changed.

mi'e is the self-introduction vocative:

> **mi'e .djan.**
>
> *I am John.*

Pro-*bridi*: The broda-series and go'i

Just as ko'a-series pronouns replace *sumti*, Lojban has *pro-bridi* that replace entire predicates or *bridi*.

The broda-series (broda, brode, brodi, brodo, brodu) are placeholder relation words, assigned with **cei**:

> **la .alis. cu gerku cei broda .i la .djan. broda**
>
> *Alice is a dog (call that "broda"). John is-broda.*
>
> =
>
> *John is also a dog.*

go'i is the most commonly used pro-*bridi*: it repeats the previous main *bridi*, optionally with new *sumti* overriding the old ones:

> **mi klama le zarci .i do go'i**
>
> *I go to the store. You [go to the store too].*

> **xu do klama le zarci .i go'i**
>
> *Are you going to the store? — Yes.*
>
> (go'i alone = "the previous bridi is true")

> **na go'i**
>
> *No.*
>
> /

> *That is not so.*
>
> (negated go'i)

---

ce'u: The Abstraction-Focus Pronoun

When you build a **ka** property abstraction (from Chapter 12), you sometimes need to indicate *which* open slot the property is "about". **ce'u** is that marker — the lambda variable of Lojban:

> **le ka melbi** — the property of being beautiful (ce'u is implicit in x_1)

> **le ka ce'u melbi** — the property [of x] of being beautiful (same, but explicit)

> **le ka mi prami ce'u** — the property of being-loved-by-me (ce'u fills x_2)

Without **ce'u**, x_1 of the abstraction is assumed to be the open slot. With **ce'u** explicitly placed, you can build properties for *any* slot:

> **do cnino mi le ka ce'u melbi** —
>
> *You are new to me in the quality of being beautiful.*

> **ta mutce le ka ce'u barda** —
>
> *That is very big.*
>
> (literally: that greatly has the property of bigness)

ce'u is used with *gismu* like **ckaji** (has property), **simlu** (seems), **mutce** (very), **traji** (superlative), and wherever a **ka** abstraction needs to specify its open place.

The go'i-series: Pro-*bridi* for Repeating and Referring

go'i (covered briefly in the pronoun chapter) is one member of a larger family of **pro-bridi** — particles that substitute for whole predicates. The full series:

cmavo	Meaning
go'i	the previous main *bridi* (re-asserts it)
go'a	a previous *bridi* (earlier in the discourse)
go'e	the *bridi* before last
go'u	a much earlier *bridi*
go'o	a later *bridi* (forward-reference)
nei	this very *bridi* (self-reference)
no'a	the surrounding *bridi* (one level up)

All of these can take new *sumti* to override specific places of the referred *bridi*:

> **mi klama le zarci .i do go'i**
>
> *I go to the store. You do too.*
>
> (go'i = "go to the store", x_1 changed to do)

> **mi klama le zarci .i do go'i le zdani**
>
> *I go to the store. You go to the home.*
>
> (go'i with x_2 overridden)

nei — *this very bridi* — is the opposite move from **go'i**: **go'i** replays the **previous** sentence; **nei** refers to the **current** predicate relationship while you are still inside it. That is what makes it useful for **recursion** and **reflexive** wording: you can nest the ongoing *bridi* inside itself (often as **le nei** "the/event of this *bridi*") without naming the predicate again.

> **ra mipri le nei**
>
> *They hide themselves.*
>
> (**le nei** packages
>
> *this*
>
> bridi as a sumti so the patient of **mipri** is tied back into the same clause — a natural reflexive).

Longer prose often uses **le nu le nei ...** (an abstraction whose inner text still means "this *bridi*"), which is how translators handle English reflexives and self-referential descriptions in one smooth Lojban clause.

go'o — *a later bridi* (forward reference). Rare in textbook prose; one pattern is promising something that will be said next:

mi nupre le nu mi go'o

I promise the event of my doing [what I will say next].

co'e (selma'o GOhA) is the pro-*bridi* for *unknown/unspecified* predicate — like **zo'e** but for *selbri*:

mi co'e le zarci

I do [something unspecified] to the store.

le go'i — descriptions from a previous *bridi*'s places:

Any GOhA word can be wrapped in **le** (or another descriptor) to extract a specific place of the repeated *bridi* as a *sumti*:

form	meaning
le go'i	the x_1 of the previous *bridi*
le se go'i	the x_2 of the previous *bridi*
le te go'i	the x_3 of the previous *bridi*

le xekri mlatu cu klama le zarci .i le go'i cu melbi

The black cat goes to the store. The [same thing = the black cat] is beautiful.

le xekri mlatu cu klama le zarci .i le se go'i cu barda

The black cat goes to the store. The [x_2 = the store] is large.

This lets you refer back to specific arguments of a previous sentence without repeating them or assigning ko'a slots.

go'e — the *bridi* before last:

go'e (= **go'i xi re**) is especially useful in conversation where two speakers alternate:

A: mi ba klama le zarci

A: I will go to the store.

B: mi nelci le si'o mi go'e

B: I like the idea of my going [to the store — repeating A's bridi].

A: do go'i

A: You will [go to the store] too.

Here B's **go'e** repeats A's sentence; A's final **go'i** repeats B's sentence. Tense particles are carried along automatically.

ra'o — updating pro-*cmavo* in reported speech:

When you quote or repeat someone else's words, the assignments they made (ko'a = X, broda = Y) were made in *their* context. **ra'o** tells a GOhA to *re-evaluate* pronoun assignments for the current speaker's context instead of copying them verbatim:

> **la alis. cusku lu mi prami ko'a li'u**
>
> *Alice says "I love [ko'a]."*
>
> **ra'o**
>
> *[Re-evaluate: for the listener, "mi" = Alice, "ko'a" = whatever Alice assigned it to.]*

Without **ra'o**, **go'i** after reported speech would re-assert literally with the original speaker's referents. **ra'o** triggers context-shift so the repeated *bridi* makes sense from the new speaker's vantage point.

---

da, de, di — bound *sumti* variables (logic)

da, **de**, and **di** are the first three **bound** *sumti* slots — "thing-1", "thing-2", "thing-3". They are meant for **general statements** (existence, "for all", "if…then") with **quantifiers** and often a **prenex zo'u**. Storytelling usually prefers **names** or **ko'a**; you reach for **da** when the point is logical form, not a specific individual you are tracking.

cmavo	Usual gloss
da	first bound thing
de	second bound thing
di	third bound thing

A minimal taste (details, scope, and negation live in Chapter 21):

> **da zo'u da klama**
>
> *Something goes.*
>
> (existential reading: there is something that goes.)

> **su'o da poi gerku zo'u da blabi**
>
> *Some dog is white.*

> **su'o da su'o de zo'u da prami de**
>
> *Something loves something.*
>
> (two existentials in the prenex.)

If you see **da** in older text without an obvious quantifier, it often abbreviates **su'o da** ("at least one thing"). Don't confuse **da** with **ko'a**: **ko'a** is *your* label for a definite referent; **da** is a *pattern variable* under quantifiers.

---

du — identity ("is the same as")

du is a **selbri** meaning identity: the *sumti* it connects are **the same entity**. It is the everyday "**X is Y**" when you **identify** or **define**, not merely compare.

> **ko'a du le nanmu**
>
> *ko'a **is** the man*
>
> — you are saying what **ko'a is** (answering "what is ko'a?").

> **la .alis. du le ninmu**
>
> *Alice is the woman*
>
> — one person, two descriptions.

By contrast, **mintu** and similar *selbri* make a **claim** about similarity or sameness-of-kind between things you already have in mind — not the same speech act as a bare identity definition. (**du** is related historically to **dunli**, but **dunli** has extra places for *how* they are equal; **du** does not.)

du also appears as **mathematical equals** in Chapter 18 (**li … du li …**). The same "same value / same thing" idea, in number land.

---

da'o — cancel assignable references

da'o (selma'o **DAhO**) **clears** assignable back-references: **ko'a**–**ko'u**, **fo'a**–**fo'u**, **broda**–**brodu** after **cei**, and similar — so none of them inherit an old referent. It does **not** change who **mi** and **do** are (speaker and listener); it does not erase **ri**'s discourse rules (there is nothing to "store" for **ri** anyway).

Use **da'o** when:

- you **join** a conversation and want to signal "don't assume my **ko'a** is yours";
- a long stretch used many assignments and you want a **clean slate** before a new block;
- you are switching exercises or examples in a textbook.

da'o — cancel assignable references

Topic markers **ni'o** / **no'i** can *also* reset discourse context (see Chapter 17); heavy **ni'o** sometimes appears together with **da'o** at a major section break.

> **la .alis. goi ko'a cu gerku .i ko'a cu melbi**
>
> *Alice, called ko'a, is a dog. It is beautiful.*

> **da'o .i ni'o la .djan. cu klama le zarci**
>
> *[Drop assignable pronouns.] [New topic:] John goes to the store.*

After **da'o**, **ko'a** has no value until you assign it again with **goi** or **cei**.

Lujvo from pro-*sumti rafsi* (advanced)

Some **cmavo** in **KOhA** and **GOhA** have **rafsi** (combining forms) for building **lujvo**. This is **specialist** material — you can read Lojban fluently without ever using it — but it explains odd dictionary entries.

- **Idea:** attach a pro-*sumti rafsi* inside a *lujvo* as if it were an internal argument of the underlying predicate. Example from the reference grammar: **donma'o** ("you-*cmavo*") ≈ *second-person pronoun* — glossed as **cmavo be zo do** (a *cmavo* for "you"). See the **Lujvo from pro-*sumti rafsi*** section in this chapter above.
- **zi'o** and other "place tricks" in *lujvo* use **zi'o**-*rafsi* patterns; the full convention is in Chapter 12 (abstractions) and Chapter 14 (how *lujvo* are formed and scored).
- **co'e**, **du**, and **bu'a** also have *rafsi*; compounds built from them pick up **context-dependent** meanings, like any vague *tanru*.

For the *cmavo*-to-*rafsi* table, Chapter 14 lists morphology details; jbovlaste lists *rafsi* when you need to check a coinage.

---

bu'a: Selbri Variables

bu'a, **bu'e**, and **bu'i** parallel **da**, **de**, **di**, but they stand in for **selbri** (relations), not *sumti*:

> **da bu'a de** — something stands in some relation to something else

> **da bu'a de .ije de bu'a da** — if A relates-to B then B relates-to A (symmetry)

They appear in logical statements (prenexes) when you want to make claims about *all predicates of a kind* or about the existence of some relation, without naming it:

> **su'o bu'a zo'u mi bu'a do**

> *There is some relation between me and you.*
>
> (I relate to you somehow)

> **ro bu'a zo'u ganai da bu'a de gi de bu'a da**
>
> *For every relation: if A-relates-to-B then B-relates-to-A.*
>
> (claim about all symmetric relations)

bu'a-series variables work exactly like da-series (bound by quantifiers in the prenex), but they fill the *selbri* slot rather than *sumti* slots.

Anaphoric Pro-*sumti* and Pro-*bridi*: Full ri-series and go'i-series

The **ri-series** back-references are based purely on recency in the discourse stream:

cmavo	Back-reference
ri	the previous *sumti*
ra	an earlier *sumti*
ru	a much earlier *sumti*

Key points:

- **ri** skips **mi**, **do**, and the ko'a/fo'a-series — but it *does* count **ti/ta/tu** (demonstratives), because you may have changed what you are pointing at since the last use.
- **ri** also skips **zo'e**, lerfu strings used as pronouns, and the ri/ra/ru words themselves.
- In **la .teris. cu klama le zarci .i ri barda**, **ri** = **le zarci** (the last completed *sumti* before **ri**), not **la .teris.**. Names with **la** *are* counted when they appear as complete *sumti* earlier in the string.
- Chaining: two **ri** in a row with no other *sumti* between them pick the *same* referent — see **ri du ri** above.

To avoid ambiguity in complex text, prefer explicit **ko'a**-assignments over **ri**.

Summary

Series	Function	Key members
mi-series	speaker/listener	**mi**, **do**, **mi'o**, **mi'a**, **do'o**, **ma'a**, **ko**
ti-series	pointing	**ti** (this), **ta** (that), **tu** (yonder)
di'u-series	utterance reference	**di'u** (previous), **dei** (this), **di'e** (next)
ko'a-series	assignable pronouns	**ko'a–ko'u**, **fo'a–fo'u** (assigned via **goi**)
ri-series	recency back-ref	**ri** (last), **ra** (earlier), **ru** (much earlier)
vo'a-series	reflexives	**vo'a** (= x_1), **vo'e** (= x_2), …
da-series	bound *sumti* (logic)	**da**, **de**, **di** — Chapter 21
du	identity *selbri*	**X du Y** — same entity; math **li … du li …** in Ch. 18
da'o	reset assignables	clears **ko'a**/…, **broda**/… (not **mi**/**do**)
KOhA/GOhA *rafsi*	rare *lujvo* pieces	e.g. **donma'o**-style compounds; see **Lujvo from pro-*sumti* rafsi** above
broda-series	pro-*bridi*	**broda–brodu** (assigned via **cei**)
go'i-series	pro-*bridi* by discourse position	**go'i** (prev), **go'a/e/u/o**, **nei** (this), **no'a** (outer)
bu'a-series	bound *selbri* variables	**bu'a**, **bu'e**, **bu'i** (used in prenexes)
ce'u	abstraction open-slot	marks the free place in a **ka** property
co'e	unspecified *selbri*	like **zo'e** but for predicates

- Names: end in consonant, written with pause marks **.name.**, used after **la**
- Vocatives: **coi** (hello), **co'o** (bye), **doi** (O …), **mi'e** (I am …)
- **la'e di'u** = the situation described by the previous sentence (not the sentence itself)

Chapter 6. Questions & Answers

Three Kinds of Questions

Lojban has a dedicated particle for each type of question you might want to ask:

Question type	Lojban particle	Meaning
Yes/no	**xu**	Is this *bridi* true?
Sumti (who/what/where/when)	**ma**	Which argument fills this slot?
Selbri (what relation)	**mo**	Which relation holds here?
Number (how many)	**xo**	What number goes here?

Each works by placing a question particle exactly where the answer would go.

---

xu: Yes/No Questions

xu is placed before any *bridi* to ask "Is this true?":

> **xu do klama le zarci**
>
> *Are you going to the store?*

> **xu la .teris. cu tirxu**
>
> *Is Terry a tiger?*

xu can also attach to a specific word to ask about just that part:

> **do xu klama le zarci**
>
> *Is it* you *that's going to the store?*
>
> (questioning the "you" part)

> **do klama xu le zarci**
>
> *Is it the store that you're going to?*

Answering xu questions:

The simplest affirmative answer is **go'i** (repeat the previous *bridi* as true) or simply **je'u** (indeed/truly):

> **xu do klama le zarci .i go'i**
>
> *Are you going to the store? — Yes [I am].*

> **xu do klama le zarci .i je'u**
>
> *— Indeed.*

The simplest negative is **na go'i** or **na'i**:

> **xu do klama le zarci .i na go'i**

> *— No [I'm not].*

You can also give a corrective answer by restating the *bridi* with the correction:

> **xu do klama le zarci**
>
> *Are you going to the store?*

> **mi klama le zdani**
>
> *[No,] I'm going home.*
>
> (corrects both agent and destination)

---

ma: Sumti Questions (Who/What/Where/When/Why)

ma stands as a placeholder in any *sumti* slot and asks "what fills this slot?":

> **ma klama le zarci**
>
> *Who goes to the store?*
>
> (ma in x_1 slot)

> **do klama ma**
>
> *Where are you going?*
>
> (ma in x_2 destination slot)

> **do tavla mi fo ma**
>
> *What language are you speaking to me in?*
>
> (ma in x_4 language slot)

> **do klama le zarci fi ma**
>
> *Where are you coming from?*
>
> (ma in x_3 origin slot, tagged with fi)

ma: Sumti Questions (Who/What/Where/When/Why)

Answers to **ma** questions are just the *sumti* that fills the slot:

> **do klama ma .i le zarci**
>
> *Where are you going? — The store.*

> **ma klama .i la .teris.**
>
> *Who's going? — Terry.*

Multiple ma in one sentence asks multiple questions at once:

> **ma tavla ma fo ma**
>
> *Who talks to whom in what language?*

The listener must supply all three values in their answer.

Since **ma** can fill any *sumti* role, it serves for English's Who/What/Where/When/Why:

- Who → **ma** in x_1 of a person-expecting *selbri*
- What → **ma** in an object slot
- Where → **ma** in a location slot (or with a spatial tense)
- When → **ma** in a time slot (or with a temporal tense)
- Why → **ma** in a cause slot (**ri'a** + **ma**, or **mu'i ma** etc. — covered in Chapter 10)

---

mo: Selbri Questions (What Relation?)

mo stands where a *selbri* would be and asks "what relationship holds here?":

> **do mo**
>
> *What are you doing?*
>
> /
>
> *What relation holds with you in x_1?*

> **ti mo**
>
> *What is this?*

mo is quite open-ended — the listener must figure out which aspect of the relation is being asked about from context:

> **do mo .i mi tavla**
>
> *What are you doing? — I'm talking.*

> **le gerku mo .i le gerku cu blabi**
>
> *What is the dog? — The dog is white.*

When you need a more specific *selbri* question, use a *tanru* with **mo** in the *tertau* slot:

> **do klama ma mo**
>
> *You go to what kind of [place]?*
>
> (mo asking about the type of destination)

---

xo: Number Questions

xo goes where a number would be and asks "how many?":

> **do ponse xo le cutci**
>
> *How many shoes do you own?*

> **xo prenu cu klama**
>
> *How many people are going?*

Answers give just the number:

> **do ponse xo le cutci .i mu**
>
> *How many shoes do you own? — Five.*

Indirect Questions

Questions can be embedded inside a *bridi* as subordinate clauses. In Lojban, this uses the abstractor **du'u** (proposition) with **kau** marking the questioned element:

> **mi djuno lo du'u ma kau klama**
>
> *I know who is going.*
>
> (indirect question: "who goes")

> **mi na djuno lo du'u xu kau do klama**
>
> *I don't know whether you are going.*

> **mi djuno lo du'u do klama ma kau**
>
> *I know where you are going.*

kau

marks the questioned element in an indirect question (turns a direct question word into an indirect one)

Indirect questions are covered in detail in Chapter 12 alongside other abstractions.

---

fi'a: Place-Structure Questions

From Chapter 4, recall **fi'a** asks which *slot* a *sumti* occupies:

> **fi'a do dunda le rozgu**
>
> *In what role are you involved in giving the rose?*

Answered with: **fa** (you're the giver), **fe** (the gift), or **fi** (the recipient).

Questions About Tense

Tense particles have question-counterparts:

> **do klama le zarci cu'au ma**
>
> *When are you going to the store?*
>
> (cu'au + ma questions tense)

More naturally, a tense question can be formed by using **ma** in a tense position:

do pu ma klama — but this isn't standard. The idiomatic form is to use the answer-question pair:

do ca ma klama le zarci

When are you going to the store?

Temporal tense questions are covered more fully in Chapter 9.

Answering Strategies

Lojban answers can be:

A single sumti (for **ma** questions):

do klama ma .i le zdani

Where are you going? — Home.

A *selbri* (for **mo** questions):

do mo .i mi citka

What are you doing? — Eating.

go'i (repeat the *bridi* = yes):

xu do nelci lo mlatu .i go'i

Do you like cats? — Yes.

na go'i (negate the *bridi* = no):

xu do nelci lo mlatu .i na go'i

— No.

A corrected bridi:

xu do nelci lo mlatu .i mi nelci lo gerku

Do you like cats? — No, I like dogs.

je'u (indeed, truly — emphatic yes):

> **je'u**
>
> *Indeed / Absolutely.*

je'u nai (not indeed — emphatic no):

> **je'u nai**
>
> *Not at all / Certainly not.*

A Sample Dialogue

> **coi .alis. .i do mo**
>
> *Hello, Alice. How are you?*
>
> /
>
> *What's up?*

> **coi .djan. .i mi klama le zarci .i xu do klama**
>
> *Hi, John. I'm going to the store. Are you going too?*

> **na go'i .i mi citka ca ti**
>
> *No. I'm eating right now.*

> **do citka ma**
>
> *What are you eating?*

> **lo cirla**
>
> *Cheese.*

> **pluka .i xu do ponse xo le cirla**
>
> *Nice. How much cheese do you have?*

> **mi ponse su'o ci le cirla .i mi na djuno lo du'u xo kau**
>
> *I have at least three pieces of cheese. I don't know exactly how many.*

cu'e: Asking About Tense or Modal

cu'e (selma'o CUhE) is the question word for tense and modal positions — it asks "what tense or circumstance applies here?":

> **do cu'e klama le zarci**
>
> *When / under what conditions do you go to the store?*

The expected answer is a tense *cmavo* or modal tag:

> **mi ba klama** (future) · **mi pu klama** (past) · **mi ca klama** (present)
> **mi mu'i le nu mi djica klama** (because I want to)

cu'e can replace any tense element in any position:

> **le verba cu cu'e sipna**
>
> *When is the child sleeping?*

> **do cu'e litru**
>
> *How/when/why do you travel?*
>
> — very open question about the circumstances of travel

When the question targets a modal specifically, the answer should be a BAI *cmavo* or **fi'o** phrase. When it targets a tense, the answer is a tense particle (**pu**, **ca**, **ba**, **vi**, **va**, **vu**, etc.).

---

ji'a: "Also" in Answers to Connective Questions

When answering a connective question (**ji** — "which one?"), the responder can use **ji'a** to mean *"and also the other option"*:

> **do nelci lo mlatu ji lo gerku**
>
> *Do you like cats or dogs?*

Answers:

> **lo mlatu** — cats (only) **lo gerku** — dogs (only) **lo mlatu .e lo gerku** — both **ji'a** — and-also: the other one too (adds to a previous answer or implies both)

ji'a signals "in addition to what was already said/implied." It is a discursive that means "also, additionally":

> **mi klama le zarci .i ji'a mi klama le ckule**
>
> *I'm going to the store. I'm also going to the school.*

While **ji'a** is not exclusively a question-answer word, it most naturally appears in contexts where an additional affirmative is being offered.

---

mo in Embedded Bridi

mo as a content question can appear inside **du'u** abstractions to ask about an embedded relationship:

> **mi djuno lo du'u do mo**
>
> *I know what you are / what relation holds for you.*

> **xu do djuno lo du'u le gerku cu mo**
>
> *Do you know what the dog is?*

The inner **mo** asks about the entire predicate relationship within the subordinate clause. The answer fills the embedded *selbri* position:

> **mi djuno lo du'u le gerku cu pendo**
>
> *I know that the dog is friendly.*
>
> (pendo answers the embedded mo)

This pattern occurs with many knowledge and communication verbs that take **du'u** complements: **djuno** (know), **cusku** (say), **jinvi** (believe), **smadi** (guess).

---

mo in Embedded Bridi

Summary

- **xu** before a *bridi* ⟶ yes/no question; answered with **go'i** / **na go'i** / corrected *bridi*
- **ma** in a *sumti* slot ⟶ who/what/where question; answered with the appropriate *sumti*
- **mo** in the *selbri* slot ⟶ what-relation question; answered with a *selbri*
- **xo** in a number slot ⟶ how-many question; answered with a number
- **kau** marks the questioned element in indirect (embedded) questions
- **fi'a** asks which place a *sumti* occupies (answered with a FA particle)
- **je'u** = emphatic yes; **je'u nai** = emphatic no
- **Whole-grammar Q&A roadmap** (all question types, **fa'u** questions, legal non-bridi answers): Chapter 17

Chapter 7. Attitudes & Interjections

What Are Attitudinal Indicators?

In English, you convey emotion through tone of voice — but tone disappears in writing. Lojban handles this with **attitudinal indicators** (**da'i** words): dedicated particles that explicitly express attitude, emotion, and stance. They have no truth value of their own; they layer emotional color onto whatever is said.

Attitudinals can appear:

- **At the start of an utterance** — coloring the whole sentence
- **After any word** — coloring just that word

> **.ui la .teris. cu klama**
>
> *[Yay!] Terry is coming!*

> **la .teris. .ui cu klama**
>
> *Terry [yay!] is coming.*
>
> (happiness is about Terry specifically)

> **la .teris. cu klama .ui**
>
> *Terry is coming [yay!]*
>
> (happiness is about the coming specifically)

All attitudinals can be negated with **-nai** (opposite) or neutralized with **-cu'i** (neutral/indifferent).

How the pieces fit together (scales and domains)

CLL pictures the attitudinal system as a small **space** you move in, not a flat list of particles. In practice you combine:

Layer	What you choose	Typical tools
Family	Roughly *what kind* of stance	**u-** simple reactions; **o-** mixed feelings; **i-** (pure) interpersonal; **a-/e-/i-** propositional (intent, obligation, belief, …) — see tables below.
Polarity	Positive ↔ middle ↔ opposite	**-nai**, **-cu'i** (when the base *cmavo* has a three-way in the table).
Intensity	How loud the feeling is	**CAI**: **-cai**, **-sai**, **-ru'e**, … (section **Intensity markers** below).
Domain	*Where* in life the feeling sits	**ro'a-series**: social / mental / emotional / physical / … (section **Emotion category modifiers** below).

Any layer can be skipped: **.ui** alone is already a full utterance. The **geometry** is just a map — it helps you see that **.uicai** is "same emotion, higher volume," and **.uiro'e** is "same happiness, but about an *idea*."

Pure Emotion Indicators

These express the speaker's feelings about the world as it is. The **u-series** are the simplest:

Attitudinal	Positive	Neutral (**-cu'i**)	Negative (**-nai**)
.ua	discovery / eureka!	—	confusion
.u'a	gain / winning	—	loss
.ue	surprise / wow!	ho-hum	expected
.u'e	wonder / awe	—	commonplace
.ui	happiness / yay!	—	unhappiness
.u'i	amusement / haha	—	weariness
.uo	completion / at last!	—	incompleteness
.u'o	courage	—	cowardice
.uu	pity / sympathy	—	cruelty
.u'u	repentance / sorry	—	no regret

> **.ui mi facki fi le mi mapku**
>
> *[Yay!] I found my hat!*

> **.ue la .teris. cu klama**

[Wow!] Terry is coming!

.uenai la .teris. cu klama

[Of course.] Terry is coming.

(it was expected)

.uu do cortu

[Poor you.] You're in pain.

(sympathy)

.u'u do cortu

[I'm sorry.] You're in pain.

(guilt/repentance — I feel responsible)

Note the distinction between **.uu** (sympathy — it's not my fault) and **.u'u** (repentance — I feel partly responsible). Both can be translated "I'm sorry" in English.

The **o-series** covers more complex or ambivalent emotions:

Attitudinal	Positive	Neutral	Negative
.o'a	pride	—	shame
.o'e	closeness / intimacy	detachment	distance
.oi	complaint / ugh!	—	satisfaction
.o'i	caution / beware!	—	rashness
.o'o	patience	—	anger
.o'u	relaxation / phew!	—	stress

.oi la .djan. klama

[Ugh!] John is coming.

(complaint about it)

.o'onai la .djan. klama

> *[Angry!] John is coming.*
>
> (anger)

> **.o'u mi facki fi le mi mapku**
>
> *[Phew!] I found my hat.*
>
> (relief)

The **i-series** (pure emotions) includes:

	Attitudinal	Positive	Neutral	Negative	
	.ii	fear / eek!	—	fearlessness	
	.i'i	togetherness / solidarity	—	aloneness	
	.io	respect	—	disrespect	
	.i'o	gratitude	—	resentment	
	.iu	love	—	hatred	
	.i'u	familiarity	—	mystery	

> **.ii smacu**
>
> *[Eek!] A mouse!*

> **la .djan. .iu klama**
>
> *John [love!] is coming.*
>
> (speaker loves John)

> **la .djan. .ionai klama**
>
> *That good-for-nothing John is coming.*
>
> (disrespect for John)

Propositional Attitude Indicators

These express the speaker's attitude *toward a potential state of affairs* — not just a feeling but an orientation (intent, hope, desire, belief, etc.):

Attitudinal	Positive	Neutral	Negative
.a'a	attentiveness	—	inattentiveness
.a'e	wakefulness / alertness	—	tiredness
.ai	intent / I will	—	indecision
.a'i	effort / try	—	lack of effort
.a'o	hope	—	despair
.au	desire / want	—	reluctance
.a'u	interest / curious	—	disinterest

> **.ai mi klama le zarci**
>
> *[I intend to] go to the store.*
>
> (signals intent, not just prediction)

> **.au mi sipna**
>
> *[I want to] sleep.*

> **.a'o mi kanryze'a**
>
> *[Hopefully] I'll feel better.*

> **.a'ucu'i do pante**
>
> *[No interest] you complain.*
>
> =
>
> *I have no interest in your complaints.*

The **e-series** covers more complex propositional attitudes:

Attitudinal	Positive	Neutral	Negative
.e'a	permission granted	—	prohibition
.e'e	competence / I can	—	incompetence
.ei	obligation / should	—	freedom from obligation
.e'i	constraint	—	freedom
.e'o	request / please	—	negative request
.e'u	suggestion / let's	—	warning

.e'o ko klama

[Please] come here!

(polite request)

.e'a ko citka

[Permission:] Go ahead and eat!

.ei mi viska le cukta

[I should] read the book.

.e'u mi'o klama le zarci

[Suggestion:] Let's go to the store.

Finally, the **i-series propositional attitudes** (overflow from the a/e sets):

Attitudinal	Positive	Neutral	Negative
.ia	belief / I believe	—	disbelief
.i'a	acceptance	—	blame
.ie	agreement	—	disagreement
.i'e	approval	—	disapproval

.ianai do pu pensi le nu tcica mi

[Disbelief!] You thought you could fool me.

.ie mi cusku

[Agreement] — I said it too.

.i'enai do .i'e zukte

*I don't approve of what you did, but I approve of you (the latter attitudinal attaches to **do**).*

Intensity Markers (CAI)

Every attitudinal sits on a **seven-point scale**. The scale runs from maximal positive through neutral to maximal negative. You express your position on the scale by appending a CAI *cmavo* directly to the attitudinal:

Suffix	Scale position	Rough English
-cai	maximal positive	extremely! absolutely!
-sai	strong positive	really, quite
-ru'e	weak positive	a little, slightly
-cu'i	neutral / cancel	(no feeling / indifferent)
nai ru'e	weak negative	slightly not
nai sai	strong negative	really not
nai cai	maximal negative	absolutely not

.uicai mi facki

[ECSTATIC!] I found it!

.uiru'e mi facki

[Mildly pleased.] I found it.

.uicu'i = I feel neither happy nor unhappy about it.

.uinai = unhappy; **.uinaicai** = absolutely miserable.

Using CAI without an emotion word acts as a pure emphasis/de-emphasis marker:

> **cai** alone = [strongly!] — emphasizes whatever follows **cu'i** alone = [whatever] — signals indifference

Applied to **.ei** (obligation), the scale captures English modal distinctions precisely:

Form	Meaning
.eicai	I absolutely must
.eisai	I should
.eiru'e	I might / could
.eicu'i	no obligation either way
.einai	I need not / must not

Evidential Indicators

Evidentials say *how the speaker knows or relates to* what they're claiming. A *bridi* marked with an evidential becomes **indisputable** in a useful sense — you're reporting your own epistemic state, which no one else can directly contradict.

Evidential	Meaning	Example
ja'o	I conclude / therefore (deduction)	*thus, therefore*
ca'e	I define / I hereby declare (performative)	*I now pronounce you...*
ba'a	I expect (future) / experience (present) / remember (past)	*I anticipate that...*
su'a	I generalize / I induce	*in general, abstractly*
ti'e	I hear / reportedly (hearsay)	*apparently, I heard that*
ka'u	I know by cultural/community knowledge	*as everyone knows, by tradition*
se'o	I know by internal/personal revelation	*I feel, I sense (privately)*
za'a	I directly observe / perceive	*I see that, I notice*
pe'i	I opine / in my opinion	*I think, I believe*
ru'a	I presume / assume	*I suppose, presumably*
ju'a	I assert (basis unstated)	neutral evidential

> **za'a la .teris. cu klama**
>
> *[I see that] Terry is coming.*

> **ti'e la .teris. cu klama**

> *[I heard that] Terry is coming.*

> **pe'i le nu do tavla cu xlali**
>
> *[In my opinion] your talking is bad.*

> **ja'o mi bilma**
>
> *[Therefore] I am sick.*
>
> (concluded from symptoms)

> **ca'e le vi mlatu cu barda**
>
> *[I hereby declare] this cat is big.*
>
> (defining it so)

> **ba'acu'i le tuple be mi cu se cortu**
>
> *[I experience] my leg hurts.*
>
> (direct sensation, present tense on the ba'a scale)

> **ru'a doi livinston.**
>
> *Dr. Livingstone, I presume?*

Ask about evidentials with **ju'apei**: *What is the basis for your claim?*

Evidentials often appear at the start of a sentence or attached to **.i** in running discourse.

Discursive Indicators

Discursives comment on the *structure* of the discourse — how this utterance relates to what was said before or after. Unlike attitudinals, they express no particular emotion.

Consecutive discourse (how this relates to the previous statement):

cmavo	Meaning
ku'i	however / but (exception to what was said)
ji'a	in addition / furthermore (adds weight)
si'a	similarly / likewise (adds another example)
mi'u	ditto / parallel case (same as above)
po'o	only / exclusively (no other comparable case)

> **mi klama le zarci .i ku'i mi na ponse lo jdini**
>
> *I'm going to the store. However, I have no money.*

> **la .alis. cadzu .i si'a la .djan. cadzu**
>
> *Alice walks. Similarly, John walks.*

> **mi po'o darxi le mi tamne**
>
> *Only I hit my cousin.*
>
> (no one else did)

Commentary on words (how words are being used):

cmavo	Meaning
va'i	in other words / rephrasing
ta'u	expanding a *tanru* into fuller terms

> **mi cadzu .i va'i mi klama lo stuzi vau lo jamfu**
>
> *I walk — in other words, I travel somewhere on foot.*

Commentary on discourse (the nature of what's being said):

cmavo	Meaning
li'a	clearly / obviously
ba'u	I exaggerate / hyperbolically
zo'o	humorously / just kidding
sa'e	precisely speaking
to'u	in short / skipping details
do'a	broadly / generously construed
sa'u	simply / merely
pa'e	fairly / impartially
je'u	truly / tautologically (nai = sarcastically/ironically)

.zo'o mi klama le solri

[Just kidding:] I'm going to the sun.

.ba'u mi ponse pa milono cutci

[Exaggerating:] I own a million shoes.

.je'unai le tcati cu glare

[Sarcastically:] The tea is hot.

(it's cold)

sa'e le cinfo cu xabju le sruri be le xamsi

Precisely speaking, the lion lives in the savanna surrounding the sea.

Knowledge (speaker's certainty):

cmavo	Meaning
ju'o	certainly (nai = uncertainly; cu'i = possibly)
la'a	probably

ju'o la .djan. klama

> *John is certainly coming.*

> **la'a mi morsi**
>
> *I'm probably dying.*
>
> (dramatic but useful example)

Discourse management (navigating the flow):

cmavo	Meaning
ta'o	incidentally / by the way (nai = anyway / back to topic)
ra'u	most importantly / above all
mu'a	for example
zu'u	on the one hand (nai = on the other hand)
ke'u	repeating same content (nai = new content / furthermore)
da'i	hypothetically / supposing (nai = in fact / actually)

> **ta'o mi pacna lo nu do klama**
>
> *By the way, I hope you come.*

> **ra'u mi na djica le nu do klama**
>
> *Most importantly, I don't want you to come.*

> **mu'a le zarci .e le briju**
>
> *For example, the store and the office.*

> **da'i do viska le mi mensi .i xu do nelci ri**
>
> *Suppose you saw my sister — would you like her?*
>
> (hypothetical framing)

> **ganai da'i do viska le mi mensi**
>
> *If [hypothetically] you saw my sister...*

(counterfactual)

ganai da'inai do viska le mi mensi

If [in reality] you see my sister...

(open conditional)

Emotion Category Modifiers (ro'a-series)

The **ro'a-series** modifiers attach *after* any attitudinal to specify which *domain of experience* the feeling belongs to. They multiply every attitudinal into six more specific variants:

cmavo	Domain	Body mnemonic
ro'a	social	hands above head
ro'e	mental / intellectual	hands on head
ro'i	emotional / heart	hands on heart
ro'o	physical / bodily	hands on belly
ro'u	sexual	hands at groin
re'e	spiritual / religious	hands sweeping around

Combine *after* an attitudinal (and after any intensity marker):

.o'unairo'o = physical discomfort (**.o'u** = comfort/relaxation, **nai** = negative, **ro'o** = physical)

.oinairo'a = social frustration / irritation

.uiro'e = intellectual joy / delight in an idea

.o'unaire'e = spiritual discomfort (e.g. feeling out of place in the wrong church)

.eiro'u = sexual obligation — a uniquely Lojbanic emotional label with no direct English word!

You can also use category words *alone*, without specifying an emotion:

ro'e = I'm concentrating / it's a mental matter **ro'anai** = I'm feeling antisocial

Attitudinal Modifiers

Beyond categories, there are eight **attitudinal modifiers** that refine *how* an emotion is experienced or expressed. They combine after an emotion+intensity string:

cmavo	Positive	Negative
ga'i	I regard the referent as below my rank	I regard the referent as above my rank (**ga'inai**)
le'o	aggressive / on the offensive	defensive (**le'onai**)
vu'e	virtuous / righteous about this feeling	sinful / guilty about this feeling (**vu'enai**)
se'i	self-oriented (for myself)	other-oriented / generous (**se'inai**)
ri'e	emotionally released / openly expressed	emotionally controlled / suppressed (**ri'enai**)
fu'i	this feeling is due to someone's help	unassisted (**fu'inai**)
be'u	I need more of this / insufficient	I have enough (**be'ucu'i**) / too much (**be'unai**)
se'a	self-sufficient in this	dependent on others (**se'anai**)

Examples:

.ause'i = [want-self] = I want it for myself! **.ause'inai** = [want-other] = I want you to have it!

.uuse'i = self-pity **.uuse'inai** = pity for others

.o'onai ri'enai = suppressed anger (I'm furious, but holding it in) **.o'onai ri'e** = openly expressing anger

.e'ese'a = I can do it all by myself! **.e'ese'anai** = I can do it if you help me.

ko ga'inai nenri klama le mi zdani

[I regard you as superior] Please enter my home.

(very formal/deferential)

ko ga'i nenri klama

> *[I regard you as inferior] Get inside!*
>
> (imperious)

ga'i attaches to the *referent*, not the speaker — so attach it to a *sumti* to mark it:

> **doi ga'inai** appended to any statement = [addressing a social superior]

Attitude Questions, Empathy, and Contours

pei — attitude question: "How do you feel?" / "Do you feel X?"

> **pei** alone = How are you feeling? / How do you feel about that? **.iepei** = Do you agree? (asking about agreement) **.aipei** = Are you going to do it? (asking about intent) **.e'apei** = May I? / Can I please?? (asking for permission) **pei.o'u** = Are you comfortable?

Respond with a CAI marker: **.iepei** → **.iecai** = Yes, absolutely!

dai — empathy: attributes the preceding attitudinal to *someone else*, not the speaker:

> **.oiro'odai** = [Pain-physical-empathy] = Ouch, that must hurt! (empathizing with their pain)

> **le bloti .iidai .uu pu klama le xasloi**
>
> *The ship, fearfully, poor thing, sank to the ocean floor.*
>
> (**.ii** is attributed to the ship via **dai**; **.uu** is the speaker's own pity)

bu'o — attitude contour: whether you are starting, continuing, or ceasing to feel an emotion:

Form	Meaning
bu'o	starting to feel this
bu'ocu'i	continuing to feel this
bu'onai	ceasing to feel this

> **.o'onai bu'o** = I'm getting angry! **.iu bu'onai .uinai** = I don't love you anymore; I'm sad.

Note that **.ui .ui .ui** ≠ **.uicai** — repeating an attitudinal means the feeling *continues*, not that it intensifies.

ge'e — the **non-specific emotion** placeholder:

- Used to express *some* feeling without naming it: **ge'e** = I feel something (but won't say what)
- Used to separate two emotion strings so a modifier doesn't bleed across: **.ui ge'eru'e** = happiness (at unspecified level) + some weak unspecified feeling
- **.iige'e** = I'm not saying whether I'm afraid or not

Miscellaneous Indicators

Some indicators fit no single category:

cmavo	Meaning
ki'a	metalinguistic confusion — "which?" / "I don't understand"
na'i	metalinguistic negation — something is wrong/invalid about what was just said
jo'a	metalinguistic affirmation — it looks wrong but it's actually correct
li'o	elision in quotation — words omitted here
sa'a	editorial insertion — this word was not in the original
xu	truth question — is this true? (equivalent to asking: is the *bridi* correct?)
bi'u	new referent (nai = previously established referent)

ki'a is among the most-used: it marks that *you heard the words but don't understand their referent or meaning*:

> **mi nelci le ctuca**
>
> *I like the teacher.*
>
> **le ctuca ki'a**
>
> *Which teacher? / The teacher — (confused)*

na'i marks a false presupposition or grammatical/factual error in what was said:

> **xu do klama** = Is it true that you're going?

bi'u helps with reference tracking in narrative:

> **le bi'u nanmu** = a man (new, not yet mentioned) **le bi'unai nanmu** = the man (previously referred to)

fu'e / fu'o: Cross-Sentence Attitudinal Scope

Normally an attitudinal colors only the word (or sentence) it follows. But sometimes you want a single attitudinal to govern a whole *passage* — multiple consecutive sentences. **fu'e** opens an attitudinal scope and **fu'o** closes it:

> **fu'e .ui**
>
> *[Start happiness scope]*

> **la .teris. cu klama .i le zarci cu melbi .i mi ponse le mi plise**
>
> *Terry comes. The store is beautiful. I have my apple.*

> **fu'o**
>
> *[End happiness scope — all three sentences above were colored by .ui]*

Without **fu'e/fu'o**, you would need **.ui** before every sentence in the passage.

Rules:

- **fu'e** must be immediately followed by an attitudinal (possibly stacked): **fu'e .ui .o'u** opens both happiness and relaxation.
- **fu'o** closes all currently open **fu'e** scopes (there is no matched-pairs system — a single **fu'o** closes everything).
- A new **fu'e** inside an open scope replaces the current scope with the new one.
- Attitudinals used *within* an open scope attach normally to individual words and don't affect the scope.

> **fu'e .oi**
>
> *[Complaint mode on]*
>
> **le zarci cu vimcu .i le karce cu spofu .i lo crino mlatu cu batci mi**
>
> *The store is closed. The car is broken. A green cat bit me.*
>
> **fu'o**
>
> *[End complaint scope]*

All three sentences are colored by **.oi** (complaint/ugh).

Vocative Indicators: Full COI Catalogue

Vocatives (selma'o COI) are used to directly address someone, establish conversational roles, or manage communication protocol. Unlike pure attitudinals, they typically precede a name (without **la**) or description; **do'u** is the elidable terminator.

doi is the general-purpose address particle, not a scale — just **doi + name**:

> **doi .djan.** — Hey John! / O John!

All COI members require a pause before a name to prevent the name absorbing the *cmavo* (write with a period: **coi .djan.**); or insert **doi** between them: **coi doi djan.**

Most COI *cmavo* form *scales* with **nai** (opposite) and sometimes **cu'i** (neutral/standby). These signal conversational state, especially in structured/radio communication.

cmavo	plain	cu'i	nai
coi	hello / greetings	—	—
co'o	goodbye / parting	—	—
ju'i	attention! / hey!	at ease	dismiss
nu'e	I promise / I commit	—	I refuse / I won't
ta'a	I interrupt	—	I yield the floor
pe'u	please (formal/polite)	—	(plain demand, not a request)
ki'e	thank you	—	you're welcome / no thanks
fi'i	welcome / you may enter	—	you are not welcome
mi'e	I am [name] / self-identification	—	I am not [name]
be'e	request to speak / may I?	standby	don't speak
re'i	I'm ready / listening	standby	not ready
mu'o	over / done speaking	I'm pausing	I'm not done yet
je'e	roger / understood	—	negative / not understood
vi'o	wilco / will comply	—	will not comply
ke'o	please repeat / say again	—	don't repeat
fe'o	signing off / end of transmission	—	not signing off

mi'e is unique — it identifies the *speaker*, not the listener:

> **mi'e .djan.** — I am John. **mi'enai .djan.** — I am not John. (denying an attribution) **fe'omi'e .djan.** — Signing off, this is John. **re'imi'e .djan.** — Ready, this is John. (e.g., answering roll-call)

The last COI in a chain controls whose name follows: if **mi'e** is last, the name is the speaker's; otherwise it's the listener's.

Selected examples:

> **coi .alis.** — Hello, Alice. **co'o** — Goodbye. **ju'i** — Attention! / Hey! **ju'icu'i** — At ease. / Stand down. **ju'inai** — Dismissed. **ki'e do** — Thank you. **ki'enai** — You're welcome. / No thanks. **fi'i .djan.** — Welcome, John. / Come in, John. **fi'inai** — You are not welcome. **be'e** — May I speak? / Request to speak. **be'ecu'i** — Stand by. **be'enai** — Don't speak. / Not now. **je'e** — Roger. / Understood. **je'enai** — Negative. / Not understood. **vi'o** — Wilco. / Will comply. **vi'onai** — Will not comply. **mu'o** — Over. (done transmitting) **mu'ocu'i** — (pausing mid-speech) **mu'onai** — I'm not done yet. **ke'o** — Please repeat. / Say again. **fe'o** — Over and out. / Signing off. **ta'a** — I interrupt. / Excuse me, I need to speak. **ta'anai** — I yield the floor. / Go ahead. **nu'e mi klama** — I promise I'll come. **nu'enai** — I won't. / I refuse.

> **ta'a mi djica lo nu cusku**
>
> *[Interrupt] I want to say something.*

> **ta'anai doi .frank.**
>
> *I yield to you, Frank.*

Scalar vocatives: quick "radio-style" flows

Many **COI** *cmavo* form **scales** (**plain / cu'i / nai**). In real conversation they often appear in **pairs** — interrupt vs yield, request vs grant, over vs still talking:

Pattern	First move	Reply	Gloss
Floor control	**ta'a**	**ta'anai**	"I need the floor" ⟶ "go ahead"
Permission to speak	**be'e**	**re'i** / **je'e**	"may I speak?" ⟶ "ready" / "understood"
End of turn	**mu'o**	**ke'o** / **mu'onai**	"over" ⟶ "repeat?" / "I'm not finished"

These are the same words as in the table above; the extra value is seeing them as **protocol slots**, not isolated greetings.

A short dialogue (attitudinals + vocatives)

Terry and Alice meet at a workshop. (In running Lojban text you would often mark the speaker with **sei la … cusku** — see Chapter 17 — here we label lines in English for readability.)

Terry: coi doi .alis. — Hello, Alice.

A short dialogue (attitudinals + vocatives)

Alice: .uicai coi doi .teris. — [Delighted] Hi, Terry!

Terry: pei do gleki — How do you feel? / Are you happy?

Alice: .iecai .i .e'u mi'o pinxe lo ckafi — Absolutely. Let's get coffee [suggestion].

Terry: je'e .i ki'e .i mu'o — Understood. Thanks. Over.

Alice: ta'anai .i fe'o — Go ahead [continue]. Signing off [playful, or end of side-channel].

This is **not** a full-length scene — it only shows **coi**, **.ui**, **pei**, **.ie**, **.e'u**, **je'e**, **ki'e**, **mu'o**, **ta'anai**, **fe'o** strung together. Extend it with **.oi**, evidentials, or more **COI** as you learn them.

---

sei … se'u: Speaker attribution in running text

sei (*selma'o* **SEI**) lets you embed a comment about the *utterance itself* without making it part of the *bridi*'s truth conditions. The most common use is speaker-tagging in dialogue transcripts:

> **.i sei la .teris. cusku se'u**
>
> *(sentence)*
>
> —
>
> *[comment] Terry says [end-comment]*

The **sei … se'u** frame is parenthetical: it does not change what the sentence asserts. **se'u** closes the frame; it can be omitted when the end is unambiguous, but keeping it is clearest.

Part	Role
sei	Opens the metalinguistic comment
(full bridi *or* selbri *phrase)*	The comment content
se'u	Closes the comment

A coffee-bar scene with sei-tagging:

> **la .teris. joi la .alis. nerkla le kafybarja**
>
> *Terry and Alice go into the coffee bar together.*

> **.i sei la .teris. cusku se'u ta'a ro zvati .i mi ba speni la .alis. .iu**
>
> *Terry said, interrupting all present: "I'm going to marry Alice, my love."*

> **.i sei la .alis. cusku se'u nu'e .djan. do ba zvati le nu mi spenybi'o**

> *Alice said: "I promise you, John — you'll be at the wedding."*

> **.i sei la .djan. cusku se'u ki'e cai**
>
> *John said: "Thank you so much!"*

> **.i sei le selfu cu cusku se'u re'i**
>
> *The server said: "Ready to take your order."*

> **.i sei la .teris. cusku se'u fi'i ro zvati .i ko pinxe pa ckafi fi'o pleji mi**
>
> *Terry said: "Welcome, everyone. A round of coffee, on me."*

> **.i sei le selfu cu cusku se'u vi'o**
>
> *The server said: "Will do."*

Grammar note: sei can appear anywhere inside a sentence — not just between sentences. It is a member of *selma'o* **SEI**; **se'u** is in *selma'o* **SEhU**. Both are covered in the text-structure section of Chapter 17.

Summary

- Attitudinals are particles expressing feeling, attitude, or epistemic stance — no truth value of their own
- **Families × polarity × intensity (CAI) × domain (ro'a-series)** — the "geometry" of the system; only the first layer is mandatory
- Attach after any word to color it; at sentence start to color the whole sentence
- **-nai** = opposite polarity; **-cu'i** = neutral/cancel; **-cai/-sai/-ru'e** = intensity scale (7 positions)
- **u-series** = simple emotions; **o-series** = complex/ambivalent; **i-series (pure)** = fear, solidarity, love, etc.
- **a/e/i-series (propositional)** = intent, desire, request, obligation, belief, agreement
- **ro'a-series** = category modifiers: social/mental/emotional/physical/sexual/spiritual
- **Attitudinal modifiers**: ga'i (rank), le'o (aggression), vu'e (ethics), se'i (self/other), ri'e (release), fu'i (assistance), be'u (sufficiency), se'a (self-sufficiency)
- **pei** = attitude question; **dai** = empathy; **bu'o** = attitude contour; **ge'e** = unspecified
- **Evidentials (ja'o ca'e ba'a su'a ti'e ka'u se'o za'a pe'i ru'a ju'a)** — source of knowledge
- **Discursives** — 5 groups: consecutive, word-commentary, discourse-commentary, knowledge, management
- **Misc**: ki'a (confused), na'i (wrong), jo'a (correct despite appearance), xu (truth question), bi'u (new referent)
- **Vocatives** (selma'o COI) manage the conversational frame; **doi** = general address particle (no scale); scalar **COI** often come in **protocol pairs** (e.g. **ta'a** / **ta'anai**)

Full COI catalogue (most form nai/cu'i scales):

- **coi** = hello; **co'o** = goodbye

Summary

- **ju'i** = attention! / **ju'icu'i** = at ease / **ju'inai** = dismissed
- **ki'e** = thank you / **ki'enai** = you're welcome
- **fi'i** = welcome / **fi'inai** = unwelcome
- **mi'e** = I am [name] (identifies speaker, not listener) / **mi'enai** = I am not [name]
- **be'e** = request to speak / **be'ecu'i** = standby / **be'enai** = don't speak
- **re'i** = ready/listening / **re'icu'i** = standby / **re'inai** = not ready
- **mu'o** = over (done) / **mu'ocu'i** = pausing / **mu'onai** = not done
- **je'e** = roger/understood / **je'enai** = negative/not understood
- **vi'o** = wilco/will comply / **vi'onai** = will not comply
- **ke'o** = please repeat / **ta'a** = I interrupt / **ta'anai** = I yield
- **nu'e** = I promise / **nu'enai** = I refuse; **pe'u** = please; **fe'o** = signing off
- Last COI in a chain governs whose name follows; **mi'e** last = speaker's name
- **sei … se'u** = parenthetical metalinguistic comment (speaker-tag in dialogue); does not affect *bridi* truth conditions

Chapter 8. Connecting Ideas

The Four Basic Logical Operations

Lojban has a systematic set of words for connecting two claims logically. The logic is *truth-functional*: the truth or falsehood of the combined claim depends only on the truth or falsehood of the parts.

Four basic operations cover almost all everyday needs:

Symbol	Operation	Truth table	Plain English
A	or (inclusive)	TTTF	at least one is true
E	and	TFFF	both are true
O	if and only if	TFFT	either both or neither
U	whether or not	TTFF	first is true regardless

Reading truth tables: the four rows represent the four cases (TT, TF, FT, FF — first-true/second-true, first-true/second-false, etc.). The result column shows whether the combined claim is true in each case.

So **A** (or) is true in three of four cases — whenever at least one component is true. **E** (and) is only true when both are true. **O** (iff) is true when both match.

Connecting Whole Sentences (ijeks)

The simplest connection is between two complete sentences. The connective goes between them, starting with **.i**:

ijek	Operation	Example
.ije	and	A and B
.ija	or	A or B
.ijo	iff	A if and only if B
.iju	whether or not	A whether or not B

la .alis. cu klama .ije la .djan. cu cadzu

Alice comes and John walks.

mi citka lo plise .ija mi citka lo perli

I eat an apple or I eat a pear.

mi gleki .iju do klama

I'm happy whether or not you come.

Negating inside the connective:

Add **na** before the vowel to negate the *first* sentence's contribution; add **-nai** after the vowel to negate the *second*:

mi citka .ijanai mi pinxe

I eat or I don't drink.

(= "I eat if I drink")

mi citka .inaja mi pinxe

I don't eat or I drink.

(= "If I eat, then I drink")

The most useful derived form is **.inaja** (if-then, material conditional):

mi klama .inaja do klama

If I go, then you go.

Forethought Connection: ga … gi

The **afterthought** form above adds the connective after the first sentence. The **forethought** form signals the connection *before* the first sentence:

Forethought	Meaning
ga … gi	either … or …
ge … gi	both … and …
go … gi	… iff …
gu … gi	… whether or not …
ganai … gi	if … then …

> **ge la .alis. cu klama gi la .djan. cu cadzu**
>
> *Both Alice comes and John walks.*

> **ga mi citka gi mi pinxe**
>
> *Either I eat or I drink.*

> **ganai mi klama gi do klama**
>
> *If I go, then you go.*

Forethought is stylistically cleaner for **if-then** constructions, since it avoids the appearance of asserting the first sentence and then qualifying it.

Connecting Sumti (eks)

To connect two *arguments* (rather than whole sentences), use **eks** — bare vowel letters (possibly with **na**/**nai**):

ek	Meaning
.a	or
.e	and
.o	iff
.u	whether or not

la .alis. .e la .djan. cu klama

Alice and John come.

mi citka lo plise .a lo perli

I eat an apple or a pear.

mi tavla la .alis. .e la .djan.

I talk to Alice and to John.

Note: **.e** between *sumti* is *not* the same as **.ije** between sentences. **la .alis. .e la .djan. cu klama** means "Alice comes and John comes (separately)" — it expands to two *bridi*. You cannot use **.e** to mean "together" — that would be **joi** (see below).

Connecting Selbri (jeks)

To connect two *relation words* (*selbri*) in a single *bridi*, use **jeks** — formed with **j** + vowel:

jek	Meaning
ja	or
je	and
jo	iff
ju	whether or not

la .teris. cu tirxu je blabi

Terry is a tiger and white.

(= both a tiger and white)

le mlatu cu melbi ja pluka

The cat is beautiful or pleasant.

mi sutra je clani

I am fast and tall.

Jeks are most commonly seen as **je**, connecting two properties of the same x_1.

Non-Logical Connectives

Not every "and" is logical. Sometimes you want to say things are *together* or form a *sequence* rather than just both being true:

/ **joi** — "in a mass together with":

Combines two *sumti* into a joint mass acting as one.

> **mi joi do cu bevri le pipno**
>
> *You and I (together as a unit) carry the piano.*
>
> (neither of us alone)

joi is the connective behind **mi'o** (= **mi joi do**). It's used when the components cooperate as a collective, not when each individually satisfies the relation.

/ **jo'u** — "jointly, in common":

Expresses a shared relationship.

> **mi jo'u do cu simxu le ka prami**
>
> *You and I mutually love (each other).*

/ **ce** — "and (in a set)":

Creates a set *sumti* from two members.

> **mi ce do cu gunma**
>
> *You and I form a group/set.*

/ **fa'u** — "respectively":

Parallel assignment — first to first, second to second.

> **la .alis. fa'u la .djan. cu klama fa'u cadzu**
>
> *Alice goes, John walks (respectively).*
>
> (Alice-goes, John-walks in parallel)

Connecting in Context: Scope

When you connect in different positions, the scope changes:

Sentence-level (.ije):

> **mi klama .ije do cadzu**
>
> *I go and you walk.*
>
> (two independent claims)

Sumti-level (.e):

> **mi .e do cu klama**
>
> *I and you go.*
>
> (same claim, both of us going)

Selbri-level (je):

> **mi klama je cadzu**
>
> *I go and walk.*
>
> (I do both to the same destination)

All three are logically equivalent when the *sumti*/*selbri* being connected share all other slots — but they differ in emphasis and brevity.

The to'e Opposite

A useful related particle: **to'e** placed before a *selbri* or *brivla* gives its *opposite*:

> **to'e melbi**
>
> *ugly*
>
> (opposite of beautiful)

> **to'e klama**
>
> *not-going / staying away*

to'e is not a connective but pairs well with **je**:

> **le zarci cu barda je to'e melbi**
>
> *The store is big and ugly.*

---

na'e and No'e: Scalar Negation

Related to negation and connection, these words mark positions on a scale:

/ **na'e** — "other than, non-":

x_1 is not the default value; some other value holds.

> **mi na'e klama**
>
> *I do something other than go.*
>
> (not necessarily the opposite — maybe I stay, maybe I run)

/ **no'e** — "midpoint, neutral":

Approximately the middle of the scale.

> **le cukta cu no'e barda**
>
> *The book is medium-sized.*
>
> (neither big nor small)

to'e — opposite end of the scale.

These three together form a scalar system: **no'e** (neutral) ⟶ **na'e** (non-default) ⟶ **to'e** (opposite). Full negation logic is covered in Chapter 13.

Why Are There Six Connective Positions?

This is a grammar-derived question that trips up many learners. The answer is that each connective position corresponds to a different **level in the parse tree**. Using the wrong class at a given level either produces a grammar error or silently changes the meaning.

Here is the full map:

Level	*cmavo* class	Connects	Example
Between full sentences	**ijek** (**.ije**, **.ija**…)	*bridi* + *bridi*	**mi klama .ije do cadzu**
Between *bridi*-tails (same x_1)	**gihek** (**gi'e**, **gi'a**…)	predicate+args, sharing x_1	**mi klama gi'e cadzu**
Between *sumti*	**ek** (**.e**, **.a**…)	*sumti* + *sumti*	**mi .e do cu klama**
Within *tanru* (*selbri*)	**jek** (**je**, **ja**…)	*brivla* + *brivla*	**mi tirxu je blabi**
Forethought (before both)	**gek** (**ge…gi**, **ga…gi**…)	both *bridi* together	**ge mi klama gi do cadzu**
Forethought within *selbri*	**guhek** (**gu'e…gi**, **gu'a…gi**…)	both *selbri* together	**mi gu'e tirxu gi blabi**

Why it matters — two examples that look similar but mean different things:

> **mi .e do cu klama** — x_1 = [mi and do]; one
>
> *bridi*
>
> , we both go **mi klama .ije do klama** — two separate
>
> *bridi*
>
> ; I go, and you go

Both translate as "I and you go" in English, but they are grammatically different. The **.e** version has a compound x_1; the **.ije** version makes two independent claims.

> **mi klama je cadzu le zarci** — I go-and-walk to the store (both go and walk, same destination) **mi klama .ije mi cadzu le zarci** — I go to the store. I walk to the store. (two claims)

The gihek shortcut: When the same x_1 does two things, **gi'e** is more concise than **.ije**:

> **mi klama le zarci gi'e facki lo cukta**
>
> *I go to the store and find a book.*
>
> (same I, two actions)

This is shorter than **mi klama le zarci .ije mi facki lo cukta** and explicitly marks that the same x_1 is doing both things.

Chaining several tails: giheks associate **left to left** — each new tail still shares the same x_1, but may introduce its **own** trailing *sumti*:

> **mi klama le zarci gi'e cadzu le dargu gi'e pinxe lo jisra**

> *I go to the store, walk on the road, and drink the juice.*
>
> (one **mi**, three predicates)

The first place of **cadzu** is the walker (**mi**); **le dargu** is the route. If a later tail needs a *different* x_1, you cannot use **gihek** — split into **.ije** sentences or rephrase.

Forethought: The **ge…gi** family signals the connective *before* the first element. This is useful when you want "if-then" without apparently asserting the antecedent:

> **ganai mi klama gi do klama** —
>
> *If I go, then you go.*

Compare to the afterthought **.inaja**, which puts the connective between them — by the time you hear the connective, the first claim has already been made.

Where to go next (tense, modals, mekso, abstractions)

Logical connectives interact with other grammar in dedicated sections:

Topic	Chapter
Tense + connective (**.i** + tense + **jek**) — *I went, then you go*	16 — Tenses and Logical Connectives
Modal + mixed connective — **.ijeki'ubo** and friends	10 — Modals
Abstractors connected with **joi** / **.e**	12 — Abstractor Connection
Connectives inside mekso (operands / operators)	18 — Mekso

Grouping Afterthought Connectives: bo

Afterthought connectives follow the *left-grouping* rule: **A .ije B .ije C** = **(A and B) and C**. When you want different grouping — *A and (B or C)* — append **bo** to the connective that should bind tighter:

> **mi nelci la djan. .ije mi nelci la martas. .ijabo mi nelci la meris.**
>
> *I like John, and (I like Martha or I like Mary).*

The **.ijabo** binds the Martha/Mary clause first. Without **bo**, **.ija** would left-group with the previous **.ije**.

The same works for *sumti* connectives:

> **mi dzukla le zarci .e le zdani .abo le ckule**
>
> *I walk to the market and (the house or the school).*

For *bridi*, explicit parentheses with **tu'e…tu'u** are clearer for complex nesting:

> **tu'e mi cinba do .ije do cinba mi tu'u .ijo tu'e mi prami do .ije do prami mi**
>
> *(I kiss you and you kiss me) if-and-only-if (I love you and you love me).*

Key rules for bo-grouping:

- **bo** after a connective = bind tighter than unmarked connectives
- Multiple consecutive **bo**-marked connectives = right-grouping among themselves
- For three or more clauses, **tu'e…tu'u** (sentences) or **ke…ke'e** (*sumti*/*tanru*) are cleaner

---

Termsets: Connecting Multiple Places at Once

When two *bridi* differ in *more than one* sumti *simultaneously* — not just one argument but two — termsets let you connect them compactly.

A **termset** groups terms together using **ce'e** (selma'o CEhE) between them. The logical connective is prefixed by **pe'e** (selma'o PEhE):

> **mi klama le zarci ce'e le briju pe'eje le ckule ce'e le zdani**
>
> *I go [to the market from the office] and [to the school from the house].*

The pairs **le zarci + le briju** (destination + origin) and **le ckule + le zdani** are the two termsets. Without **ce'e**, linking the *sumti* separately would be ambiguous about which destination pairs with which origin.

Expanding shows what this means:

> **mi klama le zarci le briju .ije mi klama le ckule le zdani**
>
> *I go to the market from the office, and I go to the school from the house.*

Forethought termsets use **nu'i** (opening bracket) and **nu'u** (closing bracket, elidable), with a gek inside:

> **mi klama nu'i ge le zarci le briju nu'u gi le ckule le zdani**
>
> *I go [both to the market from the office] [and to the school from the house].*

Termsets appear in several other contexts too: in tense coordination (CLL §10.25) and quantifier scope (CLL §16.7).

Connective Questions: ji, je'i, gi'i, ge'i, gu'i

To ask *which connective applies* between two things — not just whether the combined statement is true, but *what the logical relationship is* — Lojban uses special question *cmavo* that stand in for a connective:

cmavo	selma'o	Use
ji	A	*sumti* connective question
je'i	JA	*tanru* connective question (between *selbri* units)
gi'i	GIhA	*bridi*-tail connective question
ge'i	GA	forethought **bridi** connective question
gu'i	GUhA	forethought **tanru** connective question

> **do djica loi ckafi ji loi tcati**
>
> *Do you want coffee [what-connective?] tea?*

A yes/no question with **xu** would ask whether a *specific* relationship holds. A **ji** question asks you to *specify* the connective. Possible answers:

> **.e** — both coffee and tea **.a** — either one (you choose) **.onai** — one but not both (exclusive or)

> **la .alis. gerku gi'i mlatu**
>
> *Is Alice a dog [what-connective?] a cat?*

Answers: **gi'enai** (dog but not cat), **nagi'e** (cat but not dog), **nagi'enai** (neither), **gi'e** (both — unusual but possible). The answer **nagi'o** ("one or the other but I won't say which") is technically valid but uncooperative.

je'i asks which **JA** *cmavo* belongs between two **tanru** pieces (the same slots where **je**, **ja**, **jonai**, … appear):

> **mi sutra je'i masno cadzu**
>
> *I quickly [which connective?] slowly walk?*

Plausible answers: **je** (both modifiers apply), **ja** (one or the other), **jonai** (exactly one), and so on — each is a bare **JA**, like answers to **ji**/**gi'i**.

ge'i and **gu'i** ask which **GA** or **GUhA** starts a **forethought** connection. They are grammatical, but you should **not** answer with an isolated **ge**/**gu'e**/**ga**/**gu'a** … — that would sound like the beginning of a new forethought *bridi*. Use the **afterthought** connective instead (e.g. **.e**, **gi'e**, **je**); the connective questions summary is above in Chapter 8.

> **ge'i mi klama le zarci gi mi klama le zdani**
>
> *[Which GA?] I go to the market, I go to the house?*

> **gu'i sutra gi masno cadzu**
>
> *[Which GUhA?] quick, slow walk?*
>
> (forethought version of the **je'i** pattern above)

The answer to **ji** / **je'i** / **gi'i** is simply the bare connective — grammatically valid on its own. For **ge'i** / **gu'i**, prefer the same connective in **afterthought** shape.

Interval Connectives: bi'i, bi'o, mi'i

The selma'o **BIhI** provides three connectives for specifying *intervals* — ranges between two endpoints. These are non-logical connectives used in the same positions as JOI.

cmavo	Meaning	When to use
bi'i	unordered interval (between)	endpoints are interchangeable
bi'o	ordered interval (from…to)	order matters (direction/time)
mi'i	center-and-radius interval	one point + distance

bi'i (order doesn't matter):

> **mi ca sanli la drezdn. bi'i la frankfurt.**
>
> *I am standing between Dresden and Frankfurt.*

The interval is symmetric — "between Dresden and Frankfurt" = "between Frankfurt and Dresden."

bi'o (order matters):

> **mi cadzu ca la pacac. bi'o la recac.**
>
> *I walk from 1 o'clock to 2 o'clock.*

Here **la pacac.** must come before **la recac.** — reversing them gives an 11-hour interval. Use **sebi'o** to reverse the direction: *from 2 to 1.*

mi'i (center + radius):

> **le jbama pu daspo la .uacintyn. mi'i lo kilto be li mu no**
>
> *The bomb destroyed [an area centered on] Washington within 50 km.*

Endpoint inclusion: ga'o and ke'i

By default, **bi'i**/**bi'o** are ambiguous about whether the endpoints are included. The GAhO *cmavo* specify this:

cmavo	meaning
ga'o	closed/inclusive (endpoint is included)
ke'i	open/exclusive (endpoint is excluded)

They appear on both sides of the BIhI *cmavo*, each applying to the adjacent endpoint:

> **la drezdn. ga'o bi'i ga'o la frankfurt.**
>
> *Between Dresden and Frankfurt, inclusive of both endpoints.*

> **la drezdn. ke'i bi'i ke'i la frankfurt.**
>
> *Strictly between Dresden and Frankfurt, excluding both cities.*

> **la pacac. ga'o bi'o ke'i la recac.**
>
> *From 1 o'clock (inclusive) to 2 o'clock (exclusive).*
>
> (the hour doesn't include its endpoint)

A negated interval with **-nai** means *everything outside* that range:

> **do dicra .e'a mi ca la daucac. bi'onai la gaicac.**
>
> *You may disturb me at times outside 10–8 (i.e., not during those hours).*

Summary

Cross-links: tense + connective ⟶ Ch.16; modal + **.ije...** ⟶ Ch.10; mekso ⟶ Ch.18; abstractor connection ⟶ Ch.12.

Sentence connectives (ijeks): placed between full *bridi*

- **.ije** = and; **.ija** = or; **.ijo** = iff; **.iju** = whether-or-not
- **.inaja** = if-then (negate first); **.ijanai** = or-not-second

Bridi-tail connectives (giheks): share x_1 between two predicates

- **gi'e** = and; **gi'a** = or; **gi'o** = iff; **gi'u** = whether-or-not
- Chains (**gi'e ... gi'e ...**) = several tails for one x_1; each tail may have its own following *sumti*

Forethought connectives (geks): signal connection before first *bridi*

- **ge...gi** = both...and; **ga...gi** = either...or; **ganai...gi** = if...then

Forethought *selbri* (guheks): forethought within *tanru*

- **gu'e...gi** = both...and; **gu'a...gi** = either...or

Sumti connectives (eks): between arguments

- **.e** = and; **.a** = or

Selbri connectives (jeks): between relation words

- **je** = and; **ja** = or

Non-logical: joi (mass together), **jo'u** (jointly), **ce** (set-forming), **fa'u** (respectively)

Scalar: na'e (non-), **no'e** (middle), **to'e** (opposite)

Grouping afterthought connectives:

- Default is left-grouping: A .ije B .ije C = (A and B) and C
- **bo** appended to a connective binds tighter: **.ijabo** = bind-right
- **tu'e...tu'u** = explicit *bridi* parentheses for complex nesting

Termsets (connecting multiple places at once):

- **ce'e** = joins terms within one termset; **pe'e** + jek = the connective
- **nu'i...nu'u** = forethought termset brackets

Connective questions (ask *which* connective, not truth value):

- **ji** (A) = *sumti* connective question: *coffee ji tea?*
- **je'i** (JA) = *tanru* connective question (**mi sutra je'i masno cadzu**)
- **gi'i** (GIhA) = *bridi*-tail connective question
- **ge'i** (GA) / **gu'i** (GUhA) = forethought connective questions; answers use **afterthought** connectives (see section above)
- Answer with a bare connective: **.e**, **gi'enai**, **je**, ...
- Full question-answer protocol (including **ma fa'u ma**): Chapter 17

Interval connectives (selma'o BIhI — non-logical):

- **bi'i** = unordered interval (between); endpoints interchangeable
- **bi'o** = ordered interval (from...to); **sebi'o** = reversed
- **mi'i** = center-and-radius interval
- **ga'o** = inclusive endpoint; **ke'i** = exclusive endpoint

⚙ **bi'onai** = everything *outside* the interval

Chapter 9. Time & Space

Tense Is Optional

Lojban *bridi* carry no mandatory tense. The sentence **mi klama le zarci** can mean "I went", "I go", "I will go", or "I habitually go" — context decides which. This is deliberate: you only add tense information when it matters to the conversation.

When you do want to specify time, place a tense particle immediately before the *selbri* (or right after **cu**):

> **mi pu klama le zarci**
>
> *I [past] go to the store.*
>
> →
>
> *I went to the store.*

> **mi ca klama le zarci**
>
> *I [now] go to the store.*
>
> →
>
> *I am going to the store.*

> **mi ba klama le zarci**
>
> *I [future] go to the store.*
>
> →
>
> *I will go to the store.*

The Three Time Directions: pu, ca, ba

pu

(particle) before now / in the past

ca

(particle) at the same time / now / present

ba

(particle) after now / in the future

These three are the heart of Lojban's tense system. They come from the *gismu* **purci** (past), **cabna** (present), and **balvi** (future).

> **la .teris. pu klama le barda tcadu**
>
> *Terry went to the big city.*

> **la .teris. ba sipna**
>
> *Terry will sleep.*

Time Distances: zi, za, zu

Add a **ZI** particle after the direction to say *how far* in the past or future:

zi

short time distance (moments ago / soon)

za

medium time distance (hours, days, a while)

zu

long time distance (years, ages)

Combine direction + distance:

> **mi puzi citka**
>
> *I ate a short time ago.*
>
> (recently)

> **mi puzu citka**
>
> *I ate a long time ago.*

> **mi bazi klama**
>
> *I'll go very soon.*

mi bazu klama

I'll go a long time from now.

The distance words alone, without a direction, indicate "near/far in time but unspecified direction":

mi zi klama

I go/went/will go close to now.

(around now, not exactly now)

Time Intervals: ze'i, ze'a, ze'u

The **ZEhA** particles describe how long the event *lasts*, rather than when it happens:

ze'i
: short time interval (briefly)

ze'a
: medium time interval (for a while)

ze'u
: long time interval (for a long time)

mi ze'u sipna

I sleep for a long time.

le verba pu ze'a cadzu le bisli

The child walked on the ice for a while.

Interval words come *after* direction words:

mi pu ze'a citka

I was eating for a while [in the past].

You can also specify where in the interval the reference point falls by adding another direction after the interval:

mi ca ze'ica cusku dei

> *I am [now, short-interval spanning now] saying this.*
>
> → I am now saying this sentence.

> **mi ca ze'ipu cusku dei**
>
> *I have just been saying this.*
>
> (interval extends into the past from now)

Tense Scope: ku

Normally a tense particle before the *selbri* applies to that *bridi*. To move it elsewhere for emphasis, add **ku** after it:

> **puku mi klama le zarci**
>
> *Earlier, I went to the store.*
>
> (pu emphasized at the front)

> **mi klama le zarci puku**
>
> *I went to the store [earlier].*
>
> (pu at the end)

ku after a tense is an elidable terminator. At the end of a *bridi* it can usually be dropped.

Space Tenses: vi, va, vu and FAhA

Lojban has *spatial tenses* too, working exactly like temporal ones. Think of them as an imaginary journey from the speaker to where the event happens.

Distance (VA):

vi
: short distance / here

va
: medium distance / nearby

vu
: long distance / over there / far away

vi, **va**, **vu** work as *spatial* sumti *tcita*: they take a location landmark as their argument, just as **pu**/**ca**/**ba** take a time argument.

> **le ratcu cu citka le cirla vi le panka**
>
> *The rat eats the cheese near the park.*

> **le ratcu cu citka le cirla vu le vi panka**
>
> *The rat eats the cheese far from the nearby park.*

Direction (FAhA): specifies which way to travel

Particle	Direction
ca'u	forward / in front
bu'u	at the same location (no movement)
ti'a	behind / in back
zu'a	left
ri'u	right
ga'u	up / above
ni'a	down / below
ne'i	inside / within
be'a	north of
ne'a	near / adjacent to
fa'a	toward
to'o	away from

Direction before distance:

> **le nanmu zu'a batci le gerku**
>
> *To my left, the man bites the dog.*

> **le nanmu zu'avi batci le gerku**
>
> *A short distance to my left, the man bites the dog.*

Compound spatial tenses chain journeys:

> **le nanmu ga'u zu'a batci le gerku**
>
> *Left of a place above me, the man bites the dog.*
>
> (go up, then go left)

Space intervals (VEhA):

ve'i
: small space interval

ve'a
: medium space interval

ve'u
: large space interval

> **le verba ve'i cadzu le bisli**
>
> *The child walks on the ice in a small area.*

Combining Time and Space

When both time and space tenses appear in one *bridi*, **time comes first**:

> **le nanmu puzu vu batci le gerku**
>
> *Long ago and far away, the man bit the dog.*

> **mi bazi vi klama**
>
> *I'll go here soon.*

Aspect: co'a, co'i, ca'o, co'u

Aspect describes the *shape* of an event — is it beginning, in-progress, or complete? Aspect particles also go before the *selbri* (or after a tense particle):

co'a
: begins / starts (inchoative)

ca'o

continues / is ongoing

co'u

ends / stops

co'i

completes / perfective

mo'u

reaches endpoint / finishes

za'o

continues past its natural endpoint (excessive)

> **la .teris. co'a cadzu**
>
> *Terry starts walking.*

> **mi ca'o citka**
>
> *I am (continuously) eating.*

> **le nu klama cu co'i**
>
> *The going is/has completed.*

> **mi co'u tavla**
>
> *I stopped talking.*

From the Terry story:

> **la .teris. co'a cadzu klama le bi'unai barda tcadu**
>
> *Terry started walking to the big city.*

Tense in Subordinate Clauses

Tenses in embedded clauses are relative to the event time of the main clause, not the speaker's present:

> **mi pu djuno le du'u do ba klama**

> *I knew [past] that you would go [future relative to that past time].*

This parallels how English uses "would" in reported speech. The tense system is consistent and compositional.

Motion Tenses: mo'i + FAhA

The particle **mo'i** marks that the event involves *motion* in a direction, rather than just location. Combine it with a FAhA direction particle:

> **mi mo'i ca'u cadzu**
>
> *I walk [moving forward].*
>
> (the walking involves forward movement)

> **le gerku mo'i ri'u bajra**
>
> *The dog runs to the right.*

> **le vinji mo'i ga'u klama**
>
> *The airplane comes [moving upward].*
>
> (taking off)

Without **mo'i**, a direction particle just says *where* the event is:

> **le nanmu ca'u batci le gerku** = The man bites the dog in front of me. (location) **le nanmu mo'i ca'u batci le gerku** = The man, moving forward, bites the dog. (motion)

mo'i can combine with time and distance tenses as usual:

> **mi pu mo'i fa'a le zarci klama**
>
> *I went [past] moving toward the store.*
>
> (I headed toward the store)

Interval Boundaries: ga'o and ke'i

When you specify a time or space interval, you can mark whether the *endpoints* are included or excluded — like closed vs. open intervals in mathematics:

	cmavo	Boundary type	Meaning	
	ga'o	closed	the endpoint *is* included	
	ke'i	open	the endpoint is *not* included	

These appear right before or after interval words to mark which end they apply to:

> **mi cadzu ga'o le zarci ke'i le briju**
>
> *I walk from the store (inclusive) to the office (exclusive).*
>
> = I leave from the store (starting point counts) and stop just before the office.

> **mi sipna ze'u ga'o le nu co'a nicte ke'i le nu co'a donri**
>
> *I sleep from when night begins (inclusive) to when day begins (exclusive).*

In practice, the closed/open distinction is mostly relevant in precise mathematical or scheduling contexts, but it mirrors standard mathematical notation and is grammatically available for all interval expressions.

Rhythm and Habit: TAhE

The **TAhE** particles express whether an event happens *regularly, continuously, habitually*, or at some other rhythmic pattern:

cmavo	Meaning
ta'e	habitual / characteristic (this is the kind of thing that happens)
na'o	typically / normally (the normal state of affairs)
ru'i	continuously / without interruption
di'i	regularly / periodically / at regular intervals

> **mi ta'e citka lo plise**
>
> *I habitually eat apples.*

(it's my habit)

le mlatu na'o sipna

Cats typically sleep.

(it's normal for cats)

le pulce ru'i cpana le rokci

The dust continuously lies on the rock.

mi di'i viska le solri

I regularly see the sun.

(at predictable intervals — every morning)

TAhE particles can combine with time tenses:

mi pu ta'e citka lo plise

I used to habitually eat apples.

(past habit)

mi ba di'i klama le zarci

I will regularly go to the store.

The difference between **ta'e** and **di'i**:

- **ta'e** = habitually (general tendency, not necessarily at fixed intervals)
- **di'i** = periodically (at predictable, regular intervals — like every Tuesday)

Quick Reference

Temporal directions:

		Direction	1. Short	1. Medium	1. Long	
	Past	**pu**	puzi	puza	puzu	
	Now	**ca**	cazi	caza	cazu	
	Future	**ba**	bazi	baza	bazu	

Aspect:

Particle	Meaning
co'a	begins
ca'o	in progress
co'i	complete (perfective)
co'u	stops
mo'u	finishes
za'o	goes on too long

Space distances: vi (near), **va** (medium), **vu** (far)

Space intervals: ve'i (small area), **ve'a** (medium), **ve'u** (large)

Time intervals: ze'i (briefly), **ze'a** (a while), **ze'u** (long time)

Motion: mo'i + FAhA direction = moving-in-that-direction

Interval boundaries: ga'o (closed/inclusive), **ke'i** (open/exclusive)

Rhythm/habit (TAhE): ta'e (habitual), **na'o** (typical), **ru'i** (continuous), **di'i** (periodic)

CAhA: Actuality, Potentiality, and Capability

CLL chapter 10 covers a selma'o called **CAhA** that lets you distinguish not just *when* something happens but *whether it could happen at all*:

cmavo	Meaning
ca'a	actually is/does (real, verified fact)
ka'e	is capable of / could in principle
nu'o	can but hasn't yet (untried capability)
pu'i	has demonstrated ability (capability + evidence)

> **le karce ca'a klama le zarci**
>
> *The car actually goes to the store.*

(it's a fact right now)

le karce ka'e klama le zarci

The car is capable of going to the store.

(in principle — whether or not it does)

mi nu'o vofli

I can fly but never have.

(untried — I have the theoretical ability but no evidence)

mi pu'i vofli

I have actually flown.

(demonstrated capability — the proof is in the past event)

ca'a vs. bare tenses: a bare *bridi* without tense is tenseless (true at some time); **ca'a** asserts the present fact explicitly. In logical argument, **ca'a** is the "actualization" operator.

ka'e is especially useful for capabilities of artifacts, animals, and people:

le gerku ka'e batci

A dog is able to bite.

(it's within their nature)

le verba nu'o cadzu

The child can walk but hasn't yet.

Note on universal statements: Lojban tenseless *bridi* describe what is *universally true* of a kind, not what is happening now. So **ro datka cu flulimna** ("all ducks float-swim") is considered true even of sleeping ducks, because it describes their nature. Adding a tense marker — **ro datka ca flulimna** — still doesn't fully assert current activity; it only narrows the time. For an unambiguous "all ducks are *right now actually* swimming" you need **ca'a**: **ro datka ca ca'a flulimna**.

VIhA: Dimensionality of Events

Events can be **point-like**, **linear**, **areal**, or **volumetric**. The **VIhA** particles tag this:

cmavo	Dimensionality
vi'i	one-dimensional (a line)
vi'a	two-dimensional (a surface)
vi'u	three-dimensional (a volume)
vi'e	four-dimensional (a space-time region)

> **mi vi'i klama le bisli**
>
> *I travel along the ice in a line.*
>
> (linear path)

> **le bredi cu vi'a cpana le foldi**
>
> *The seed covers the field (as a surface).*

> **le djacu cu vi'u nenri le botpi**
>
> *The water fills the bottle (volumetrically).*

VIhA is used mainly in precise spatial descriptions; for everyday speech the bare VA distance particles are usually enough.

Story Time: Tenses Relative to Narrative Point

In narrating events, you often set a *story-time reference point* and then describe other events relative to it. Lojban handles this explicitly with **ki**:

/ **ki** — "sticky tense" bookmark:

Attaches to a tense to make it the *persistent reference point* for subsequent *bridi*.

> **puki mi klama le zarci .i le zarci cu barda**
>
> *[Setting: past.] I go to the store. The store is big.*
>
> (both past)

With **ki** appended to a tense particle, all subsequent *bridi* without an explicit tense use that reference:

> **puki** = set "past" as the current reference point **baki** = set "future" as the reference **caki** = reset to "present" (speaker's now)

This is how Lojban fiction works: set **puki** once, and everything that follows is understood as past until reset:

> **puki la .teris. klama le tcadu .i ri melbi .i la .teris. facki lo cukta**
>
> *[Past:] Terry goes to the city. It is beautiful. Terry finds a book.*

All three sentences are past without repeating **pu** each time.

Without **ki**, every *bridi* resets to tenseless (ambiguous time). With **ki**, you establish a narrative time and stay there.

Compound Spatial Tenses

Spatial tense particles can be **chained** to describe a multi-step imaginary journey through space. Each step adds a direction (FAhA) optionally followed by a distance (VA):

> **le nanmu ga'u zu'a batci le gerku**
>
> *The man [up] [left] bites the dog.*
>
> *To the left of a place above me, the man bites the dog.*

The journey proceeds left to right: first move upward from the speaker, then move left from there. The English gloss reverses the order (innermost step first).

You can attach a distance to each direction separately:

> **le nanmu zu'avi ga'u vu batci le gerku**
>
> *The man [left-short] [up-long] bites the dog.*
>
> *Far above a place slightly to my left, the man bites the dog.*

A distance without a following direction says how far away the event is without specifying direction:

> **le nanmu vi zu'a batci le gerku**
>
> *The man [short-distance] [left] bites the dog.*
>
> *Left of a place near me, the man bites the dog.*

Any number of direction+distance steps may be stacked. In practice, one or two steps are most common.

Interval Sizes: VEhA and ZEhA

By default, a tense just says *when* something happens — it says nothing about how long it takes. The *cmavo* of **VEhA** (space) and **ZEhA** (time) specify the *size of the interval* over which the event occurs.

cmavo	selma'o	meaning
ve'i	VEhA	short space interval
ve'a	VEhA	medium space interval
ve'u	VEhA	long space interval
ze'i	ZEhA	short time interval
ze'a	ZEhA	medium time interval
ze'u	ZEhA	long time interval

These are relative to context — "short" for a geological event is different from "short" for a sentence.

> **le verba ze'a cadzu le bisli**
>
> *The child [medium-time-interval] walks on the ice.*
>
> *For a medium amount of time, the child walks on the ice.*

ZEhA as a sumti tcita (interval specified by reference to an event):

> **loi snime cu carvi ca le ze'u dunra**
>
> *Snow falls during the long winter.*
>
> (the winter is long; the snow falls in it)

Here **le ze'u dunra** is the sumti of the tense tag **ca** — the event of snow falling is located within the interval described as "the long winter."

> **le verba ve'i cadzu le bisli**
>
> *The child [small-space-interval] walks on the ice.*
>
> *The child walks on the ice in a small area.*

Intervals combine with directions and distances. The interval always comes *after* the distance/direction:

le verba pu ze'a cadzu le bisli

The child [past] [medium-interval] walks on the ice.

For a medium time in the past, the child walked on the ice.

Orienting the interval

By adding a PU or FAhA *cmavo after* the ZEhA (or VEhA), you specify where the reference point falls relative to the interval:

mi ca ze'ica cusku dei

I [present] [short-interval-present] say this.

I am saying this sentence now.

(the interval straddles the present moment)

mi ca ze'ipu cusku dei

I [present] [short-interval-past] say this.

I have just been saying this sentence.

(interval extends from the past to now)

mi pu ze'aba citka le mi sanmi

I [past] [medium-interval-future] eat my meal.

For a medium time afterward [from that past moment], I ate my meal.

Without the trailing PU/FAhA, the relationship between reference point and interval is unspecified.

Space Interval Modifier: FEhE

The ZAhO aspect particles (**co'a**, **ca'o**, **co'u**, **mo'u**, **za'o**) normally describe the *phase of an event in time*. The *cmavo* **fe'e** (selma'o FEhE) is a flag that **transfers the ZAhO interpretation to space** — meaning "apply this event-contour notion to space, not time."

> **ko vi'i fe'e di'i sombo le gurni**
>
> *You [1-dimensional] [space:] [regularly] sow the grain.*
>
> *Sow the grain evenly in a line!*

> **mi fe'e ciroi tervecnu lo selsalta**
>
> *I [space: three-places] buy salad ingredients.*
>
> *I buy salad ingredients at three separate locations.*

The **fe'e** prefix can also be used with ZAhO:

> **tu ve'abe'a fe'e co'a rokci**
>
> *That [medium-space-interval-north] [space:] [start-of] is-a-rock.*
>
> *That is the beginning-edge of a rock extending northward from me.*

Here **co'a** (*beginning of*) is applied to the spatial extent of the rock rather than to time — the southern face is the "beginning" because the interval extends northward.

Story Time

In ordinary Lojban, a tenseless *bridi* has no implied temporal relationship to other *bridi*. But in *narrative* — a story, a report, a sequence of events — speakers use a different convention called **story time**.

In story time:

- Each new tenseless sentence is understood to occur **after** the previous one.
- A sticky tense set with **ki** establishes the narrative starting point.
- An explicit tense in a sentence is interpreted *relative to the current story time*, not the speaker's present.
- After a flashback (a sentence with explicit tense reaching back in time), story time returns to where it was before the flashback.

Example mini-story:

> **pu zu ki ku** —
>
> *[long ago, sticky:]*

This sets the story to "long ago." From here, all tenseless sentences are understood as long ago, advancing forward in time.

.i ko'a citka loi kanba rectu —

She was eating goat's meat.

.i ko'a pu jukpa ri le mudyfagri —

(Flashback) She had cooked it over a wood fire.

.i lei rectu cu zanglare —

The meat was pleasantly warm.

(story time resumes after the flashback)

The flashback with **pu** goes before the eating event but does not advance story time. After the flashback sentence, story time picks up where the eating left off.

Story time is how Lojban narratives are written naturally — set a time with **ki**, then let sentences flow without repeating the tense. Use explicit tenses only for flashbacks (**pu**) or flash-forwards (**ba**).

Tenses in Subordinate Bridi

When a *bridi* is embedded inside another (as an abstraction, relative clause, or description), the inner tense is interpreted **relative to the outer tense**, not relative to the speaker's present.

English works differently: English always measures tense from the speaker's present. Lojban follows the convention of Russian and Esperanto — relative tense.

la djan. ca cusku le se du'u la jord. ca klama le zarci

John [present] says the-statement-that George [present] goes to the market.

John says that George is (right now, while John speaks) going to the market.

la djan. pu cusku le se du'u la jord. ca klama le zarci

John [past] said the-statement-that George [present] goes to the market.

John said that George was (at the time of John's saying) going to the market.

In the second sentence, **ca** inside the subordinate *bridi* means "simultaneously with John's speaking (in the past)" — not "simultaneously with right now." This is the key difference from English.

> **la djan. pu cusku le se du'u la jord. pu klama le zarci**
>
> *John [past] said the-statement-that George [past] went to the market.*
>
> *John said that George had gone to the market*
>
> (before the moment of speaking).

nau: Override to Speaker's Present

When you are deep inside nested subordinate *bridi* but want to refer to the *speaker's actual present moment* (not the relativized one), use **nau** (selma'o CUhE):

> **la djan. pu cusku le se du'u nau mi sipna**
>
> *John [past] said the-statement-that [now-actually] I am asleep.*
>
> *John said that (as I am telling you this) I am asleep.*

nau escapes all the relative tense nesting and points directly to the moment of utterance. It cannot be combined with other tense particles (except through logical connection). It has no effect on sticky tenses.

Tense Negation

Tense particles can be negated with **nai** to produce roughly the opposite meaning:

> **mi pu klama le zarci** — I went to the store. **mi punai klama le zarci** — I didn't go to the store [in the past]. (equivalent to na in many contexts, but specifically negates the tense)

More usefully, **nai** on ZAhO aspect particles means the event is *not at that stage*:

> **mi ca'onai citka** — I am not in the middle of eating.

Tense negation contrasts with *bridi* negation (**na**): **mi na pu klama** negates the whole claim (it is not the case that I went), while **mi punai klama** specifically says "at past time, not going" — a subtle but sometimes important distinction.

Vague intervals — pu is not English “finished past”

If you do **not** give a **ZEhA** interval size, Lojban leaves the interval **vague**. **mi pu klama le zarci** puts *some* part of the going in the speaker’s past — it does **not** promise the whole trip ended before “now” (English *went* often implies completion). Likewise:

> **le tricu ba crino**
>
> *The tree will be green*
>
> — does **not** exclude the tree being green already; the stretch of "being green" may have begun.

To force completion, phases, or duration, use **ZAhO** (**co'i**, **co'u**, ...), **ze'a**, or more specific wording — not **pu** alone.

Tense tagging a *sumti* (sumti tcita)

Besides floating tenses (**ku**) or pre-*selbri* position, a tense can sit **immediately before a sumti** to relate the main *bridi* to that *sumti* in time or space.

Time:

> **mi klama le zarci ca le nu do klama**
>
> *I go to the store **at the same time as** your going.*

> **mi klama le zarci pu le nu do pu klama le zdani**
>
> *I go to the market in the past **of** your (then) going to the house*
>
> — often glossed as *I had gone to the market before you went to the house._

Space:

> **le ratcu cu citka le cirla vi le panka**
>
> *The rat eats the cheese **in the vicinity of** the park.*

jai + tense promotes the tagged place to $\mathbf{x_1}$ of a new *selbri*; the old x_1 can reappear as **fai** (Chapter 4):

> **le panka cu jai vi citka le cirla fai le ratcu**
>
> *The park is the locus of the rat's eating the cheese.*

> **mi djuno fi le jai ca morsi be fai la .djan.**
>
> *I know about the time when John is dead*

—

the time of John's death.

Temporal **ZAhO** and **roi** can also tag *sumti*; see CLL-style advanced examples when you need phase-of-process relative to **le nu**.

Sub-events: stacked contours and counts

You can stack aspect and repetition without a connective:

la .djorj. ca'o co'a ciska

George continues to begin to write.

(each cmavo narrows the phase)

mi reroi ca'o xaroi darxi le damri

On two occasions, I keep hitting the drum six times each time.

The cross-product connective **pi'u** between counts (CLL's "twelve shots" from 2×6) exists but is rare; treat it as advanced.

Tenses vs modals

Syntax: Tenses and modals occupy the same structural "slots": before the *selbri*, with **ku**, as **sumti tcita**, in connections, and with **jai**. **Semantics:** tenses answer **when / where** the *bridi* sits; modals add **why / how / in what language / with what tool** — roles beyond the *gismu*'s built-in places. A single *bridi* can carry both: **mi pu klama le zarci mu'i le nu mi djica** — past going, motivated by wanting.

Beyond "short / medium / long" distances

ZI and **VA** only give three coarse sizes. For **exact** offsets or durations, Lojban uses **mekso** (numbers), **nu'i** … **nu'u** termsets after a tense tag, and related machinery (Chapter 14, Chapter 16, Chapter 18). Everyday prose rarely needs this; skip until you write precise schedules or physics.

Full FAhA direction inventory (reference)

The quick table earlier lists common directions. The full set includes (static “where” / **mo'i** “moving” uses the same *cmavo*):

FAhA	Gloss (static)
ca'u	in front (of viewer)
ti'a	behind
zu'a	to the left
ri'u	to the right
ga'u	above
ni'a	below
ne'i	inside
ru'u	surrounding
pa'o	transfixing / through (penetrating)
ne'a	next to
te'e	bordering
re'o	adjacent
fa'a	toward (a point)
to'o	away from
zo'i	inward (toward center)
ze'o	outward (from center)
zo'a	tangential
bu'u	coincident / same place
be'a	north
ne'u	south
du'a	east
vu'a	west

Compass and viewer-relative directions mix; pick one frame and stay consistent in a passage.

Finally: mixed tense practice (capstone)

*Use this block to integrate everything from the chapter: **read**, **name the pieces**, **produce**.*

Finally: mixed tense practice (capstone)

1 — Identify components

For each *bridi*, say which **selma'o** you see (e.g. **PU**, **ZI**, **ZEhA**, **FAhA**, **VA**, **ZAhO**, **ROI** …) and in what order they attach:

mi puze'a klama le zarci

le verba cu vi ne'i le zdani co'u sipna

la .djan. reroi pu klama le briju

2 — Paraphrase

Express roughly: "I will go to the store soon" vs "I will go to the store a long time from now" using **ba** + **ZI** (and **ku** only if you need to front the tense).

3 — Connective question (ties to Chapter 8 and Chapter 16):

la .artr. pu je'i ba nolraitru

What does **je'i** ask for? What kinds of answer are grammatical?

4 — Optional stretch (harder)

Skip these until the rest of the chapter feels easy; they mix **sticky tense**, **double aspect**, and **"vague future"** readings.

- **Sticky narrative: puki** is **pu** + **ki** — the tense sticks for later *bridi*. What tense is the second sentence?

  mi puki klama le zarci .i mi klama le zdani

  I [past-sticky] went to the market. I go to the house.

- **Stacked contours:** Name both **ZAhO** pieces and the overall story (start vs stop vs ongoing):

  mi ca'o co'u bajra

- **Vague interval (trap):** Does **ba** always mean "will / going to"? Paraphrase the following without adding a false English "will":

  le tricu ba crino

For **bridi negation** vs tense order (**na ku**), see Chapter 13.

Summary

- Tense is always optional; omit it when context is clear
- **pu** / **ca** / **ba** = past / present / future
- **zi** / **za** / **zu** = short / medium / long time distance (combined: **puzi**, **bazu**, etc.)
- **ze'i** / **ze'a** / **ze'u** = interval size (how long the event lasts)
- Spatial tenses use **vi/va/vu** (distance) and FAhA particles (direction)

Summary

- **mo'i** + FAhA = motion tense (the event involves movement in that direction)
- **ga'o** = closed endpoint (inclusive); **ke'i** = open endpoint (exclusive)
- TAhE rhythm: **ta'e** (habit), **na'o** (typical), **ru'i** (continuous), **di'i** (periodic)
- Time comes before space when both are given
- Aspect particles (**co'a, ca'o, co'i, co'u, mo'u, za'o**) describe the shape of events
- Use **ku** to move a tense out of default position for emphasis
- **CAhA**: **ca'a** (actually), **ka'e** (capable), **nu'o** (untried), **pu'i** (demonstrated)
- **VIhA**: **vi'i** (line), **vi'a** (surface), **vi'u** (volume), **vi'e** (space-time)
- **ki**: sticky-tense bookmark — sets reference for subsequent *bridi*; **caki** resets to present

Compound spatial tenses:

- Multiple FAhA *cmavo* stack (inner first): **zu'avi'i** = a short line forward
- VEhA (spatial interval): **ve'i** = small area, **ve'a** = medium, **ve'u** = large
- ZEhA (temporal interval): **ze'i** = short, **ze'a** = medium, **ze'u** = long
- Both stack on direction: **puze'a** = for a medium past duration

FEhE — space interval modifier:

- Placed after a spatial tense to specify the *shape* of the space interval
- **vi FEhE** + FAhA = the space around the event is in direction FAhA

Story time and nau:

- **ki** (sticky tense) advances the narrative reference time implicitly in stories
- Tenseless sentences in a narrative pick up the sticky tense from prior context
- **nau** overrides all tense context — forces interpretation relative to speaker's actual now
- **puki** = set story-past reference; subsequent sentences without tense are past relative to it

Finally (capstone): mixed tense drills + **je'i** — see **Finally: mixed tense practice** above (including **optional stretch**)

Chapter 10. Modals & Causality

What Are Modals?

Every numbered place in a *gismu*'s place structure was chosen during language design. But real speech sometimes needs to attach extra information beyond those fixed slots — things like *with what tool*, *because of what*, *for what purpose*, *in what language*, and so on.

Lojban handles this with **modal tags** (**sumti tcita**): particles that introduce an extra argument with a specific semantic role. They come in two forms:

1. **fi'o + selbri** — build a custom modal from any relation word
2. **BAI cmavo** — pre-built shorthand modals for common roles

Both work the same way: tag goes directly before the argument that fills that role.

---

fi'o: Custom Modal Tags

fi'o followed by a *selbri* creates a modal meaning "filling x_1 of [*selbri*]":

> **mi viska do fi'o kanla le zunle**
>
> *I see you [x_1-of-eye: the-left-thing]*
>
> →
>
> *I see you with my left eye.*

Here **fi'o kanla** means "in the role of x_1 of kanla (eye)" — so **le zunle** fills that role. The x_1 of **kanla** is the eye, so this says the left thing is the eye used.

Since we often want a place *other* than x_1, combine **fi'o** with SE conversion:

> **mi viska do fi'o se pilno le zunle kanla**
>
> *I see you [x_1-of-se-pilno: the-left-eye]*
>
> →
>
> *I see you using my left eye.*

se pilno = "is used by x_2 to ..." so x_1 of **se pilno** is the *tool*. **le zunle kanla** fills that tool slot.

The terminator **fe'u** closes a **fi'o** modal (usually elidable):

> **mi klama le zarci fi'o se pilno le karce fe'u**
>
> *I go to the store [by-means-of: the car]*
>
> →
>
> *I go to the store by car.*

BAI: Pre-built Modal Shorthand

Because certain modal roles are needed constantly, Lojban provides ready-made **BAI cmavo** (selma'o BAI). Each is derived from a specific *gismu* and abbreviates **fi'o [that *gismu*]**.

Here are the most useful BAI modals:

Causality:

BAI	From *gismu*	Meaning of tag
ri'a	rinka (physical cause)	because of [physical cause]
seri'a	se rinka	with effect [physical result]
mu'i	mukti (motivation)	because of [motive/intention]
ki'u	krinu (justification)	because of [justification]
ni'i	nibli (logical entailment)	because [logically]
ja'e	jalge (result)	resulting in
gau	gasnu (agent)	done by [agent]
zu'e	zukte (purpose)	for the purpose of
tezu'e	te zukte	with goal

Circumstance:

BAI	Meaning
bai	under compulsion of
bau	in language / using language
pi'o	using tool
sepi'o	with tool (x_1 of se pilno)
ca'i	by authority of
ci'e	in the system/framework of
do'e	vague relation (general "of/with")

Causality in Depth

English has one word "because" where Lojban has four distinct causal relations:

rinka

x_1 (event) physically causes x_2 (event)

mukti

x_1 (event) is the motive/intention causing x_2 (event)

krinu

x_1 (event/fact) is the justification for x_2

nibli

x_1 (proposition) logically entails x_2

le spati cu banro ri'a le nu do djacu dunda fi le spati

The plant grows because you water it.

(physical causation)

mi lebna le cukta mu'i le nu mi tadni

I take the book because [my motive is] studying.

(intentional motivation)

la .sokrates. morsi binxo ni'i le nu ro remna cu morsi

Socrates died because [logically] all humans die.

(logical entailment)

la .djan. cpacu le pamoi se jinga ki'u le nu le skina cu melbi

John gets first prize because [justification:] the film is beautiful.

These distinctions eliminate a vast amount of ambiguity inherent in English "because", "since", and "therefore".

Modal Sentence Connection

A modal tag can also *connect two full sentences* — saying the second happened because of (or caused, or was justified by) the first. Use **.i + modal + bo** in afterthought:

le spati cu banro .iri'abo do djacu dunda fi le spati

The plant grows; [because] you water it.

Or use **seri'a** (= with effect) to connect in the other direction:

do djacu dunda fi le spati .iseri'abo le spati cu banro

You water the plant; [therefore] it grows.

The **-bo** prevents the modal from grabbing the next *sumti* as its argument; without **bo**, **.iri'a do** would mean "because of you" (taking **do** as its *sumti*).

Forethought modal connection (signal before first *bridi*):

ri'a gi do djacu dunda fi le spati gi le spati cu banro

Because you water the plant, it grows.

(ri'a ... gi ... gi)

Common BAI Examples

mi tavla bau la .lojban.

I speak in Lojban.

(bau = in language)

mi cadzu sepi'o le tuple

I walk using my legs.

(sepi'o = with tool = legs)

do klama zu'e le nu do citka

You go for the purpose of eating.

(zu'e = for purpose)

mi viska do gau le drata

I see you [done-by: another person]

→ someone else causes me to see you / someone shows you to me.

mi tavla do ca'i le turni

I speak to you by authority of the governor.

ko tavla mi bai [ku]

Talk to me under compulsion!

> → Talk to me whether you want to or not!

Tense and Modal Together

Modal tags and tense tags occupy the same structural position before the *selbri*. They can co-occur in any order:

> **mi pu klama le zarci zu'e le nu mi citka**
>
> *I went to the store for the purpose of eating.*

> **mi ba cadzu sepi'o le karce ri'a le nu le karce cu spofu**
>
> *I will walk by means of (no, wait) — because the car is broken.*

(Rethought: in practice you'd pick one modal per tag slot, or separate into multiple *bridi*.)

Modal Selbri (BAI + ku)

A BAI particle followed by **ku** (with no following *sumti*) becomes a standalone modal without a specific argument, meaning "in-the-relevant-way":

> **mi tavla bau la .lojban. bai ku**
>
> *I speak in Lojban under compulsion*
>
> (bai = under compulsion, but who's compelling is unspecified)

> **mi cadzu sepi'o ku**
>
> *I walk using [some unspecified tool]*

This lets you signal the type of relationship without specifying the filler — useful when the filler is obvious from context.

Key BAI Quick Reference

BAI	Source *gismu*	Core meaning
ri'a	rinka	physical because
seri'a	se rinka	physical therefore
mu'i	mukti	motivated by
ki'u	krinu	justified by
ni'i	nibli	logically because
ja'e	jalge	resulting in
gau	gasnu	with agent (done by)
zu'e	zukte	for purpose of
bau	bangu	in language
pi'o	pilno	with user
sepi'o	se pilno	with tool
ca'i	catni	by authority of
do'e	(generic)	vaguely related to

Modal Negation

Modals can be negated with **nai** after the BAI particle to assert the *absence* of that relation:

> **mi klama le zarci mu'inai**
>
> *I go to the store without motivation.*
>
> (or: the motivation does not apply to my going)

> **mi klama le zarci ki'unai le nu mi djica**
>
> *I go to the store, not for the reason of wanting to.*

This is modal negation — it negates the *role* the *sumti* plays, not the whole *bridi*. Compare:

- **mi na klama le zarci mu'i le nu mi djica** = It's not the case that I go to the store due to wanting to. (*bridi* negation — whole claim is false)
- **mi klama le zarci mu'inai le nu mi djica** = I do go, but not *because of* wanting to. (modal negation — the causal link is denied)

Sticky Modals: ki with BAI

Just as **ki** makes tenses sticky (persistent across *bridi*), it can also make **modal tags** sticky. Append **ki** to any BAI to set it as the default modal for subsequent *bridi*:

> **bau la .lojban. ki mi tavla .i mi cusku .i mi pensi**
>
> *[In Lojban (set):] I talk. I say. I think.*
>
> (all three understood as happening in Lojban)

> **mu'i le nu mi prami do ki mi klama le zarci .i mi dunda le cukta**
>
> *[Motivated by loving you (set):] I go to the store. I give the book.*
>
> (both actions share the same motivation)

Reset a sticky modal with the bare BAI + **ki** with no argument (or start a new **ki** binding):

> **do'eki** = "unspecified relation (set)" — vague reset **bau ku ki** = reset to no specified language

Sticky modals are especially useful in narrative when a single circumstance or cause applies to a whole sequence of events.

BAI reference (official selma'o)

Every **BAI** *cmavo* is tied to a *gismu*'s place (see the dictionary gloss: "*gismu* modal, _n_th place ..."). The list below matches `cmavo.tsv` / `gismu.tsv` in this repo — not every spatial direction (**ri'u**, **zu'a**, ...) is a BAI; those are **FAhA**, used as tense tags, not modal **fi'o**-style tags.

Causality, result, and purpose

BAI	From	Gloss (short)
ri'a	rinka	because of (physical/mental) cause
mu'i	mukti	because of motive
ki'u	krinu	because of reason / justified by
ni'i	nibli	logically; because of logic
ja'e	jalge	therefore; with result
zu'e	zukte	with goal-seeking actor
fau	fasnu	in the event of

Agency, instrument, beneficiary

BAI	From	Gloss (short)
gau	gasnu	with active agent
pi'o / **sepi'o**	pilno	used by / with tool
va'u	xamgu	benefiting from

Comparison and superlative

BAI	From	Gloss (short)
mau	zmadu	exceeded by … (see **se mau** for the usual “more than” reading)
me'a	mleca	undercut by … (see **se me'a** for “less than”)
du'i	dunli	as much as
rai	traji	with superlative … (x_1 of **traji**)
verai	(compound)	superlative among … (**traji** x_4)

Language, culture, category, conditions

BAI	From	Gloss (short)
bau	bangu	in language
ku'u	kulnu	in culture
le'a	klesi	in category
va'o	vanbi	under conditions
ma'i	manri	in reference frame

Other common ones

BAI	From	Gloss (short)
bai	bapli	compelled by
ca'i	catni	by authority of
ci'e	ciste	in system
do'e	(elliptical)	vague modal
du'o	djuno	according to / known by
fa'e	fatne	reverse of
fi'e	finti	created by
kai	ckaji	characterizing
mu'u	mupli	exemplified by
po'i	porsi	in sequence
tai	tamsmi	resembling / in form like
ta'i	tadji	by method
pu'e	pruce	by process
zau	zanru	approved by

Not BAI: kau (indirect-question marker, **UI**), **zu'u** (discursive "on the one hand …", **UI**), **ri'u** (**FAhA** direction).

For the complete alphabetical list, use jbovlaste or another official *cmavo* index; this site's dictionary data may also expose **BAI** entries programmatically.

Modal Comparatives: mau and me'a

Two BAI *cmavo* are especially useful for comparisons: **mau** (from **zmadu**, *more than*) and **me'a** (from **mleca**, *less than*). Their place structures:

gismu	place structure
zmadu	x_1 is more than x_2 in property x_3 by amount x_4
mleca	x_1 is less than x_2 in property x_3 by amount x_4

Because what you typically want to specify is the *basis for comparison* (x_2 — the thing being compared to), these BAI are usually used with **se** conversion:

- **semau** — "more than [comparison basis]" (x_2 of zmadu)
- **seme'a** — "less than [comparison basis]" (x_2 of mleca)

> **la frank. nelci la betis. semau la meiris.**

Frank likes Betty more than [he likes] Mary.

The **semau la meiris.** gives the basis: Frank's liking for Mary is what Betty's is being compared to.

la frank. nelci la meiris. seme'a la betis.

Frank likes Mary less than [he likes] Betty.

Same information, different emphasis.

Modal Relative Phrases: pe/ne + modal

When a comparison applies specifically to a *sumti* rather than to the whole *bridi*, attach the modal using a *relative phrase* — **pe** (restrictive) or **ne** (incidental):

la frank. nelci la betis. ne semau la meiris.

Frank likes Betty, who he likes more than Mary.

Without **ne**, **semau la meiris.** would attach to the whole *bridi* (comparing the event of liking to Mary, which is nonsense). The **ne** binds the comparative to **la betis.** specifically.

la frank. nelci la meiris. ne seme'a la betis.

Frank likes Mary, whom he likes less than Betty.

This pattern works with many other BAI. Some common ones used with relative phrases:

Modal	Meaning	Example
semau	more than	**lo tanxe ne semau ti** = a box (the bigger one)
seme'a	less than	**lo tanxe ne seme'a ti** = a box (the smaller one)
du'i	as much as	equal comparison
seba'i	instead of	used in place of
ci'u	on scale of	specifies scale explicitly

Pure comparison (without asserting the main *bridi*):

le ni la frank. cu nelci la betis. cu zmadu le ni la frank. cu nelci la meiris.

The degree to which Frank likes Betty exceeds the degree to which he likes Mary.

This asserts only the comparison — it doesn't claim Frank actually *likes* either of them.

Connecting Modals Logically

When two *bridi* differ only in their modal tags, Lojban lets you reduce them to a single *bridi* with a connected modal. The connection works like any other logical connective:

> **mi klama le zarci ri'a le nu lo gerku cu batci mi**
>
> *I go to the store because a dog bit me.*

> **mi klama le zarci ki'u le nu mi djica**
>
> *I go to the store because (justified by) I want to.*

To say both simultaneously:

> **mi klama le zarci ri'aje ki'u le nu ...**
>
> *I go to the store because of [physical cause AND justified reason] ...*

Or in afterthought:

> **mi klama le zarci ri'a le nu lo gerku cu batci mi .i ji'a ki'u le nu mi djica**

When a *single event* is both the physical cause and the motivation:

> **mi klama le zarci ri'a ce'e ki'u le nu lo gerku cu batci mi**
>
> *I go to the store [physically-because AND justification-because] a dog bit me.*

The **ce'e** creates a termset: both modal tags apply to the same *sumti* simultaneously.

Logical connective + modal together: You can assert *both* that two *bridi* are connected by logic (**.ije** = and) *and* by a modal relation — the modal is glued after the logical connective, before **bo**:

> **mi nelci do .ije mi nelci la .djim.**
>
> *I like you, and I like Jim.*

> **mi nelci do .iki'ubo mi nelci la .djim.**
>
> *I like you; justified by [the fact that] I like Jim.*

> **mi nelci do .ijeki'ubo mi nelci la .djim.**
>
> *I like you **and**, with that justified by [the fact that], I like Jim.*
>
> — both the **.ije** and the **ki'u** link apply.

When the two *bridi* differ only in one *sumti*, you can compress:

> **mi nelci do .eki'ubo la .djim.**
>
> *I like you and/because Jim.*
>
> (sumti-level **.e** + **ki'u** + **bo**)

Forethought connectives stay *either* logical *or* modal — not mixed in one **gi** chain. See Chapter 8 for connective details.

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seBAI: General Conversion Rule

Any BAI *cmavo* can be prefixed with **se** (or **te**, **ve**, **xe**) to shift which place of the source *gismu* is being filled:

- **mau** fills x_1 of **zmadu** ("exceeded by ...")
- **semau** fills x_2 of **zmadu** ("more than ..." — the comparison basis)
- **temau** fills x_3 of **zmadu** ("in property of ...")
- **vemau** fills x_4 of **zmadu** ("by amount ...")

This works for *any* BAI, not just comparatives:

BAI	seBAI	shift
ri'a	**seri'a**	x_2 of rinka ⟶ the effect (therefore)
mu'i	**semu'i**	x_2 of mukti ⟶ the motivated action
gau	**segau**	x_2 of gasnu ⟶ the action done by the agent
pi'o	**sepi'o**	x_2 of pilno ⟶ the tool (most common form)
zu'e	**tezu'e**	x_3 of zukte ⟶ the goal
ci'u	**seci'u**	x_2 of ckilu ⟶ the scale used

The conversion mirrors SE on *selbri*: **seBAI** fills "the thing that [source *gismu*]'s x_2 is" relative to the BAI's argument.

Irregular BAI shapes

Most **BAI** *cmavo* are regular **CV'V** pieces cut from a *gismu*'s first consonant + two vowels. The 65 BAI *cmavo* include 36 regular **CV'V** forms and a set of irregular ones. The irregularities fall into four categories:

1. CVV form (monosyllables — no apostrophe):

BAI	Source *gismu*	Meaning
bai	bapli	compelled by
bau	bangu	in language
cau	claxu	without (lacks)
fau	fasnu	in the event of
gau	gasnu	with active agent
koi	korbi	at the edge/boundary of
mau	zmadu	exceeded by… (CVV + uses 2nd consonant)
rai	traji	superlative among… (CVV + uses 2nd consonant)
kai	ckaji	characterizing… (CVV + uses 2nd consonant)
sau	sarcu	necessarily
zau	zanru	approved by

2. Uses the 2nd consonant of the *gismu* (collision avoidance):

BAI	Source *gismu*	Why
mau	z**m**adu	first consonant would be **z**, already used
rai	t**r**aji	first consonant **t** would clash
kai	c**k**aji	first consonant cluster
la'u	k**l**amu	first consonant **k** would clash
le'a	k**l**esi	first consonant **k** would clash

3. Based on a *lujvo*, not a bare *gismu*:

BAI	Source	Meaning
tai	tamsmi	in the form/manner of

4. Irregular 2nd vowel:

BAI	Source *gismu*	Meaning
ga'a	ganra	regarding (observer's viewpoint)
ki'i	kansa	in the company of
me'e	cmene	by name
ra'a	srana	pertaining to
ra'i	krasi	from the source of
ti'i	stidi	suggested by
tu'i	stuzi	at the site of
ma'e	marji	made of material

do'e stands alone: it is the **generic/vague modal** not derived from any specific *gismu*. Use it when no other BAI fits.

You do not need to memorize all irregularities — dictionary entries list each BAI's source. This table explains why **mau** is not **zmu** and why dictionaries look inconsistent at first glance.

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jai — modal conversion (full treatment in Chapter 4)

jai turns the **modal's sumti** into **x_1** of the *bridi*, and shoves the old x_1 into **fai** when it still needs a slot. Chapter 4 has the full pattern (**jai gau**, **se jai**, etc.). One classic **bau** example:

> **la .lojban. jai bau cusku fai mi**
>
> *Lojban is the language of my expressing [something].*
>
> (**la .lojban.** = modal "language" place as x_1; **mi** = old speaker in **fai**.)

jai also has a non-modal abstraction use (*sumti* raising); Chapter 12 ties that together.

Tense Stacking: The Imaginary Journey

When multiple tense elements appear before a *selbri*, they are not redundant — each one *extends* the reference point established by the previous one. Think of it as taking an imaginary journey:

1. Start at the "default" reference point (usually the speech moment, **nau**).
2. The first tense element moves you to a new reference point.
3. The second tense element moves you *again* from that new point.
4. The *selbri*'s event happens at wherever you've arrived.

> **mi pu ba klama le zarci**

> *I [past] [then future] go to the store.*

Step 1: move *backward* to some past moment (**pu**). Step 2: from that past moment, move *forward* (**ba**). The result: I will go to the store *at some point after that past moment* — possibly still in the past relative to now, or possibly in the future.

This explains why **pu ba** ≠ **ba** and ≠ **pu**: it means "at some point after X, where X was in the past."

> **mi ba pu klama le zarci**
>
> *I [future] [then past] go to the store.*

Step 1: move forward to some future point (**ba**). Step 2: from that future point, move backward (**pu**). The result: before that future moment, I go to the store — this describes something that will have already happened by a certain future time.

The imaginary journey applies equally to direction tenses (**vi/va/vu**) and event contours (**co'a**, **ca'o**, etc.), allowing very precise temporal-spatial descriptions.

Summary

- **fi'o + selbri** creates a custom modal tag from any relation word
- **BAI cmavo** are predefined shorthand modals for common semantic roles
- Four causal BAI: **ri'a** (physical), **mu'i** (motivation), **ki'u** (justification), **ni'i** (logical)
- Modal sentence connection: **.iri'abo** (because-of), **.iseri'abo** (therefore)
- Forethought modal: **ri'a gi … gi** (because [A], [B])
- BAI + **ku** = modal without specified argument (role implicit from context)
- BAI + **nai** = modal negation (that role does *not* apply)
- BAI + **ki** = sticky modal (persists across subsequent *bridi* until reset)

Modal comparatives:

- **semau** = more than [basis] (x_2 of **zmadu**); **seme'a** = less than [basis] (x_2 of **mleca**)
- Attach to *bridi*-level: **la frank. nelci la betis. semau la meiris.** = Frank likes Betty more than Mary
- Attach to *sumti* via **ne/pe**: **la betis. ne semau la meiris.** = Betty (the one he likes more than Mary)
- Without **ne**, a comparative modal attaches to the whole *bridi* — often nonsensical
- Pure comparison (no main-*bridi* assertion): **le ni … cu zmadu le ni …**

Connected modals:

- Modals can be joined by jeks: **ri'aje ki'u** = both physically-because and justified-because
- **ce'e** in a termset: both modal tags apply to the same *sumti* simultaneously
- Mixed logical + modal: **.ijeki'ubo**, **.eki'ubo** (logical connective + **ki'u** + **bo**)

Other:

- Many **BAI** are regular **CV'V**; **mau**, **kai**, **rai**, **tai**, **do'e** are common exceptions — see **Irregular BAI shapes** above
- **jai** + modal: Chapter 4; abstraction **jai** without modal: Chapter 12

Summary

Chapter 11. Relative Clauses & Possession

What Is a Relative Clause?

A **relative clause** is a mini-*bridi* attached to a *sumti* that says more about it. In English: "the dog *that bit me*", "the store *I went to*", "the person *who is singing*".

What are you pointing at?

ti, **ta**, and **tu** only say how far away something is — not *what* part of the thing you mean. Point at someone's face and say:

> **ti cu barda**
>
> *This is big.*

Is **ti** the whole person, the nose, or a tiny patch of skin? Relative clauses exist so you can **narrow** the referent with a full mini-*bridi*:

> **ti poi ke'a prenu cu barda**
>
> *This [thing], which is a person, is big.*

> **ti poi ke'a nazbi cu barda**
>
> *This [thing], which is a nose, is big.*

> **ti poi ke'a nazbi bo kapkevna cu barda**
>
> *These [things], which are nose-pores, are big.*
>
> (**kapkevna** ≈ skin-hole / pore; **bo** groups the tanru clearly.)

Same pointing gesture — three different **poi** clauses, three different meanings. The rest of this chapter explains how to build and combine these clauses; **pe** / **po** / **po'e** shortcuts come a bit later.

In Lojban, relative clauses attach to *sumti* using two particles:

poi
: restrictive relative clause — narrows down which referent is meant

noi
: incidental relative clause — adds parenthetical information about an already-identified referent

What are you pointing at?

The relative clause is closed by the elidable terminator **ku'o**. Inside the clause, **ke'a** stands for the *sumti* the clause is attached to.

---

poi: Restrictive Relative Clauses

poi introduces a clause that *restricts* the referent — you need it to know which thing is meant:

> **le gerku poi blabi cu barda**
>
> *The dog that is white is big.*

Without "that is white", you wouldn't know which dog. The **poi** clause is essential to identification.

ke'a marks the relativized *sumti*'s position inside the clause:

> **ti poi ke'a prenu cu barda**
>
> *This thing such that it is a person is big.*
>
> →
>
> *This person is big.*

When **ke'a** falls in x_1, it can be omitted (the default):

> **le gerku poi blabi cu barda = le gerku poi ke'a blabi cu barda**
>
> *The dog that is-white is big.*

ke'a can fill any slot in the clause:

> **tu poi le mlatu pu lacpu ke'a cu ratcu**
>
> *That thing which the cat dragged is a rat.*

Here **ke'a** is in x_2 of **lacpu** (the dragged object), not x_1.

---

noi: Incidental Relative Clauses

noi adds parenthetical information. The referent is already identified; the clause just elaborates:

> **le gerku noi blabi cu barda**

> *The dog, which is white, is big.*

The comma-equivalent is the key difference from **poi**. In **noi**, the clause doesn't change *which* dog — you already know. It just adds "and by the way, it's white."

> **mi noi pajni cu zvati**
>
> *I, a judge, am present.*
>
> (who I am is already known; "judge" is extra info)

> **le mi karce noi blabi cu spofu**
>
> *My car, which is white, is broken.*
>
> (I have one car; its whiteness is incidental)

vs.

> **le mi karce poi blabi cu spofu**
>
> *My car that is white is broken.*
>
> (I have multiple cars; we need "white" to pick the right one)

The distinction maps onto English punctuation: **poi** = no commas (restrictive), **noi** = with commas (incidental).

Restrictive clause vs. *tanru*: Often you can fold the property into the *selbri* instead of using **poi**:

> **xu do viska le mi blabi karce**
>
> *Do you see my white car?*

That is close in spirit to **le mi karce poi blabi**, but a tanru like **blabi karce** can be vague (white *things* about the car, carriers of white things, etc.). A **poi** clause can only mean “the car *is* white” in the sense of the *bridi* inside **poi**. For precise identification, prefer **poi** when it matters.

Multiple Relative Clauses: zi'e

To attach more than one relative clause to the same *sumti*, join them with **zi'e**:

> **le gerku poi blabi zi'e poi batci le nanmu cu klama**

> *The dog that is white and that bites the man goes.*

> **le gerku poi blabi zi'e noi le mi pendo cu ponse cu batci**
>
> *The dog that is white, which my friend owns, bites [someone].*

You can mix **poi** and **noi** with **zi'e**.

Possession: pe, po, po'e, po'u

Rather than a full relative clause, Lojban has *relative phrase* shortcuts using **GOI** *cmavo*. These are a single particle followed by one *sumti*:

/ **pe** — loose association ("associated with"):

Like saying "of" or "belonging to" in a general, contextual sense.

> **le stizu pe mi cu blanu**
>
> *The chair of mine is blue.*
>
> (the one I'm currently sitting on, or loosely associated with)

/ **po** — specific possession (alienable):

A more permanent connection, typically ownership.

> **le stizu po mi cu xunre**
>
> *My chair is red.*
>
> (the one I own)

/ **po'e** — intrinsic/inalienable possession:

Cannot be separated from the possessor without changing them.

> **le birka po'e mi cu spofu**
>
> *My arm is broken.*
>
> (it's intrinsically mine — body part)

/ **po'u** — identity:

This isn't possession but identification: "which is [the same thing as]".

Possession: pe, po, po'e, po'u

> **le gerku po'u le mi pendo cu cinba mi**
>
> *The dog, which is my friend, kisses me.*
>
> (dog = my friend, same entity)

> **le tcadu po'u la .nu,IORK. cu barda**
>
> *The city which is New York is big.*
>
> (disambiguates which city)

ne — incidental loose association (like **noi** version of **pe**)

> **le blabi gerku ne mi cu batci do**
>
> *The white dog, which is mine, bites you.*

no'u — incidental identity

> **le nanmu no'u la .djim. cu terpemci**
>
> *The man, Jim, is a poet.*

A **GOI** phrase is **one** *sumti* after the marker; the phrase ends with an elidable **ge'u** (almost always dropped) if something else follows that could be confused with more of the phrase.

Phrase or full clause? (GOI and poi)

Many **GOI** phrases say the same thing as a longer **poi** clause — the phrase is just shorter when the relation is a simple "about / associated with":

> **le stizu pe mi cu blanu**
>
> *My chair is blue*
>
> (loose association).

> **le stizu poi ke'a srana mi cu blanu**
>
> *The chair that pertains to me is blue.*

— same idea, with **srana** (x_1 pertains to x_2).

po is stronger than **pe** ("specifically associated" — often possession): **le stizu po mi ≈ le stizu poi ke'a se steci srana mi** in spirit. You do not need to memorize the long form; use it when you are unsure what **pe** vs **po** implies.

Possession vs. Place Structures

Many gismu already have an "owner" or "body" place built in. For body parts, you can use the place structure directly:

le birka be mi cu spofu = le birka po'e mi cu spofu

My arm is broken.

(birka x_2 = the body it belongs to)

When the gismu has the right slot, this is more concise than using **po'e**. But **po'e** is more general — it works even when there's no dedicated place.

---

be: Filling Inner Places of a Description Selbri

When you build a description with **le**, you can fill the *selbri*'s non-x_1 places inside the description using **be** ... **bei** ... **be'o**:

be

fills x_2 of the *selbri*

bei

fills x_3, x_4, etc.

be'o

closes the **be** construction

le dunda be le rozgu bei mi

The giver of the rose to me

(dunda: x_1 gives x_2 to x_3; be=x_2=le rozgu, bei=x_3=mi)

le klama be la bastn. bei la .atlantas.

The goer to Boston from Atlanta

This is how you build rich, place-filled descriptions without breaking them into separate sentences.

le birka be mi = the arm of my body (using be to fill x_2 of birka)

Why does be/bei/be'o exist?

This is a grammar-motivated question. Without **be**, the parser faces an ambiguity whenever a *sumti* follows the *selbri* inside a description:

le mamta mi — is **mi** filling x_2 of **mamta** (= my mother)? Or is it a

second sumti

in the outer bridi?

The answer from the grammar: a bare *sumti* after a *selbri* inside a **le** description is **not** interpreted as filling the *selbri*'s inner places. It is parsed as another *sumti* of the outer *bridi*.

be is the explicit signal that says "this sumti belongs *inside* the description, filling a numbered place of the selbri":

le mamta be mi = unambiguously "the mother of me" **le mamta mi** = ambiguous / likely parsed as two separate

sumti

The chain continues with **bei** for each additional inner place:

le dunda be le rozgu bei mi bei la .paris.

The giver of the rose to me in Paris

(dunda: x_1=giver x_2=thing given x_3=recipient x_4=origin)

be'o closes the chain. It is needed when a relative clause or another structural word immediately follows — without it, the parser might try to absorb the relative clause into the **be** chain:

le dunda be le rozgu bei mi be'o poi melbi cu zvati

The giver of the rose to me who is beautiful is here.

(**be'o** explicitly ends the inner-place filling before **poi**)

In practice **be'o** is often omitted when **ku** or the end of the description makes the boundary clear, but it is required to avoid ambiguity with relative clauses.

Relative Clauses in Descriptions with be

You can combine **be** and relative clauses:

> **le gerku poi blabi be mi**
>
> *The dog that is white (that belongs to me)*

or:

> **le gerku be mi poi blabi**
>
> *My dog that is white*
>
> (be mi = x_2 of gerku = my body? No — gerku x_2 is breed, not owner)

The interaction of **be** and relative clauses requires care: **be** fills a numbered place, while relative clauses are adjuncts. They combine freely.

---

voi: The Speaker-Restrictive Clause

voi is a variant of **poi** that creates a "speaker-asserted" restrictive clause, parallel to the **le** vs **lo** distinction:

> **lo prenu poi klama** —
>
> *a person who comes*
>
> (really is a going-person)

> **lo prenu voi klama** —
>
> *a person who I call a going-person*
>
> (speaker's description)

voi is less common but worth knowing.

---

vu'o: Relative Clauses Across Complex Sumti

Normally, a relative clause attaches only to the immediately preceding *sumti*. But what if your *sumti* is complex — already carrying a **pe** phrase or a **be** chain? **vu'o** extends the attachment point to span the entire sumti:

> **le gerku pe mi poi blabi cu barda**
>
> *The dog of mine that is white is big.*
>
> (poi attaches to "le gerku pe mi" as a whole)

Without **vu'o**, a relative clause in an ambiguous position might attach to just the innermost piece. With **vu'o**, you make explicit that the clause modifies the entire complex:

> **le gerku pe mi vu'o poi blabi cu barda**
>
> *My dog, [as a whole,] which is white, is big.*

vu'o is the signal: "the relative clause that follows attaches to everything from the start of this description, not just the last word."

This becomes important with longer chains:

> **le dunda be le rozgu bei mi vu'o poi melbi cu klama**
>
> *The giver of the rose to me, who is beautiful, comes.*
>
> (**poi melbi** modifies the whole description "giver of the rose to me", not just **mi**)

Relative Clauses in Vocative Phrases

When addressing someone with a vocative, you can add a relative clause to describe *which* person you're calling:

> **coi ro do poi klama le zarci**
>
> *Hello, all of you who are going to the store!*

> **doi la .djan. poi melbi**
>
> *Hey John who is beautiful!*
>
> (or: Hey, you beautiful John)

> **pe'u do poi ponse le karce**
>
> *[Please,] you who own the car.*

The relative clause after a vocative works like any other — it restricts (poi) or adds information (noi) about the person being addressed.

Relative Clause Position Effects

Where you place a relative clause relative to a description can subtly change the meaning:

After a le description — restricts which individuals are meant (most common):

> **le gerku poi blabi cu barda**
>
> *The dog(s) that are white are big.*
>
> (poi restricts: only the white dogs)

After a bare lo description — the clause becomes part of the description itself, defining what kind of thing counts:

> **lo gerku poi blabi cu barda**
>
> *Something that is a white dog is big.*
>
> (the clause and the selbri together define the type)

Inside a description (before the selbri, after the descriptor) — the clause applies to the entire description-group quantifier, not just the final member:

> **le poi blabi ku gerku cu barda**
>
> *(Grammatically unusual; normally the clause follows the full noun phrase.)*

The safest rule: relative clauses follow their entire sumti. Use **vu'o** to disambiguate when the sumti is complex.

Nested Relative Clauses and ke'a Subscripts

When a relative clause appears inside another relative clause, both use **ke'a** as the relativized pronoun — but they refer to different sumti. Without disambiguation, this is ambiguous:

> **le prenu poi prami le gerku poi batci ke'a**

Which **ke'a** — the person or the dog? To disambiguate, subscript **ke'a** with **xi**:

> **le prenu poi ke'a xi pa prami le gerku poi batci ke'a xi re**

> *The person₁ who loves the dog₂ that bites [the person₁]*

ke'a xi pa refers to the outer relative clause's antecedent (the person); **ke'a xi re** refers to the inner clause's antecedent (the dog). Alternatively, assign one of the sumti to a ko'a slot before introducing the clause:

> **le prenu goi ko'a poi prami le gerku poi batci ko'a**
>
> *The person [= ko'a] who loves the dog that bites ko'a*

The ko'a approach is clearer in most practical writing.

Relative Clause Terminators: ku'o vs vau

Both **ku'o** and **vau** can close a **poi/noi/voi** relative clause:

- **ku'o** — the dedicated NOI terminator; closes only relative clauses.
- **vau** — the general bridi terminator; also valid here and one syllable shorter.

In most cases, both are elidable at the end of the relative clause (before the main bridi's selbri or before **.i**). The case where a terminator must be *kept* is when the relative clause is followed immediately by another relative clause without **zi'e**:

> **le gerku poi blabi ku'o noi barda cu klama**
>
> *The dog, which is white and which (by the way) is big, comes.*

Without **ku'o**, the parser might try to attach **noi barda** to the wrong level. Using **zi'e** to join them is usually cleaner:

> **le gerku poi blabi zi'e noi barda cu klama**

Summary

Particle	Type	Meaning
poi	restrictive rel. clause	such-that / which (narrows referent)
noi	incidental rel. clause	which-incidentally (adds info)
voi	speaker-restrictive	which-I-describe-as (speaker's framing)
ke'a	relative pronoun	"it" inside the clause
zi'e	clause joiner	connects multiple rel. clauses
vu'o	attachment extender	clause applies to entire preceding complex sumti
pe	loose association	of / associated-with (contextual)
po	specific possession	my / owned-by (alienable)
po'e	intrinsic possession	my [body part / inalienable]
po'u	identity	which-is / that-is (same entity)
ne	incidental association	(incidental pe)
no'u	incidental identity	(incidental po'u)
ge'u	closes GOI phrase	elidable after the possessed sumti
be/bei/be'o	inner place filler	fills numbered places inside description

Chapter 12. Abstractions

The Core Idea

Lojban lets you take an entire *bridi* — a whole claim — and treat it as a *thing*: an event, a property, a proposition, a quantity. This is called **abstraction**, and it's done by prefixing a *bridi* with one of the **NU** particles.

Without abstractions, you can say **mi klama le zarci** (I go to the store). With abstraction, you can wrap that up and talk *about* the going:

> **le nu mi klama le zarci**
>
> *the event of my going to the store*

This abstract *sumti* can now go in any slot of another *bridi*:

> **le nu mi klama le zarci cu pluka**

> *The event of my going to the store is pleasant.*

> **mi nelci le nu mi klama le zarci**
>
> *I like the event of my going to the store.*
>
> →
>
> *I like going to the store.*

The *bridi* inside an abstraction is closed by **kei** (elidable terminator). When the abstraction ends the sentence or is followed by **cu**, **kei** can usually be omitted.

---

nu: Events

nu is the general event abstractor — the most common NU.

nu

x_1 is an event/state described by the *bridi*

> **le nu la .teris. cadzu**
>
> *the event of Terry walking*

> **le nu do klama cu ckape**
>
> *The event of you coming is dangerous.*

Lojban "events" in this sense can be brief (a kiss) or lifelong (breathing). **nu** doesn't care — it just packages the *bridi* as a thing that happened / is happening / will happen.

Four refined event abstractors:

mu'e

point-event — the *bridi* seen as a single unstructured moment

pu'u

process — structured event with beginning, stages, end

zu'o

activity — repetitive or cyclic event

za'i

state — condition that either holds or doesn't

le mu'e la .djan. catra la .djim.

the (point-event) of John killing Jim

— seen as instantaneous

le pu'u le latmo balje'a cu porpi

the process of the Roman Empire falling apart

— structured and extended

mi tatpi ri'a le zu'o mi plipe

I'm tired because of the activity of jumping.

le za'i mi jmive cu ckape do

The state of my being alive is dangerous to you.

All four can be replaced by bare **nu** with some loss of precision.

---

ka: Properties

ka abstracts a *property* — a quality that things can have or lack.

ka

x_1 is the property described by the *bridi*

Properties are used to fill quality-slots in many *gismu*:

do cnino mi le ka xunre

You are new to me in the quality of being red.

→

Your redness is new to me.

mi zmadu do le ka clani

I exceed you in the property of being tall.

→

I am taller than you.

ce'u marks the "open slot" of the property — the thing that *has* the property:

le ka ce'u clani

the property of being tall

(ce'u = the thing that is tall)

When the open slot is x_1 (default), **ce'u** can be omitted. But when it's in another position, you need it:

le ka mi prami ce'u

the property of being loved by me

(ce'u = the thing loved)

le ka ce'u prami mi

the property of loving me

(ce'u = the lover)

These two properties are very different! The explicit **ce'u** prevents ambiguity.

Two ce'u = a relationship abstraction (rare but valid):

le ka ce'u prami ce'u

the relationship of loving

---

du'u: Propositions

du'u abstracts a *proposition* — a claim that is either true or false.

du'u

x_1 is the proposition that [*bridi*]

Use **du'u** when you want to talk about a claim as a fact (something known, believed, said, etc.):

mi djuno le du'u do klama

> *I know the proposition that you are going.*
>
> →
>
> *I know that you are going.*

> **mi jinvi le du'u le mlatu cu melbi**
>
> *I believe the proposition that the cat is beautiful.*
>
> →
>
> *I think the cat is beautiful.*

> **la .alis. cusku le du'u mi cadzu**
>
> *Alice says the proposition that I walk.*
>
> →
>
> *Alice says that I walk.*

du'u vs **nu**: Use **du'u** for mental and verbal acts (knowing, believing, saying, claiming). Use **nu** for physical/experiential events (seeing, hearing, doing, liking in a sensory way):

> **mi djuno le du'u do klama** —
>
> *I know **that** you're going.*
>
> (proposition) **mi viska le nu do klama** —
>
> *I see **the event of** you going.*
>
> (event/perception)

du'u vs **jei: du'u** is the *claim*; **jei** is the *truth value* (how true the claim is, including fuzzy "shades"). Curiosity or doubt often fits **jei** better than plain **du'u**:

> **mi kucli le du'u la .frank. cu bebna**
>
> *I'm curious whether Frank is a fool.*

> **mi kucli le jei la .frank. cu bebna**

> *I'm curious how true it is that Frank is a fool.*

Truth still lives in the outer predicate: **mi djuno le du'u ...** only works for facts you actually know; the abstraction itself does not "contain" truth.

x_2 of du'u — linguistic form: du'u has a second place: a piece of language that *expresses* the *bridi*. **le se du'u** (or **le se du'u ...** with the predication filled) is the usual *sumti* when someone *said something equivalent* to a claim without quoting exact words:

> **la .djan. cusku le se du'u la .frank. cu bebna**
>
> *John says something to the effect that Frank is a fool.*

That differs from **lu ... li'u**, which asserts he used those exact Lojban words.

---

ni: Amounts

ni abstracts a *measurable quantity*:

ni

x_1 is the amount/degree of [*bridi*]

> **le ni le pixra cu blanu**
>
> *the amount of the picture being blue*
>
> →
>
> *how blue the picture is*

> **mi zmadu do le ni mi clani**
>
> *I exceed you in how tall I am.*
>
> →
>
> *I am taller than you.*
>
> (comparing amounts)

ni only makes sense with measurable properties. "The amount of Jane being a mother" (**le ni la .djein. mamta**) is meaningless — motherhood isn't measurable on a scale.

ka vs ni:

le pixra cu cenba le ka ce'u blanu

The picture varies in the property of being blue.

(blueness comes and goes — yes/no)

le pixra cu cenba le ni ce'u blanu

The picture varies in how blue it is.

(the degree of blueness changes)

---

jei: Truth Values

jei abstracts the *truth value* of a proposition — is it true or false, and to what degree?

le jei li re su'i re du li vo

the truth value of 2+2=4

→ evaluates to "true"

jei is most useful in fuzzy contexts where truth admits degrees, or when you want to explicitly handle truth as a value:

le jei do klama

the truth value of whether you are going

mi djuno le jei do klama

I know whether you are going.

jei has an $\mathbf{x_2}$ place (like **ni**) for the scale or standard of "how true" — important in fuzzy logic; everyday speech often leaves it implicit.

---

si'o: Concepts / Ideas

si'o abstracts a *concept* or idea as it exists in someone's mind:

le si'o lo prenu cu simxu prami

> *the concept of people loving each other*

> **mi nelci le si'o la lojban.**
>
> *I like the idea of Lojban.*

si'o is used for mental representations, ideals, and the conceptual content of thoughts — more subjective than **du'u**.

x_2 place: x_1 is the concept [*bridi*]; x_2 is who holds it — a person, a community, or a "mind" in the broad sense. When you fill x_2, **close the abstraction *bridi* with kei first**, then **be**:

> **le si'o lo prenu cu simxu prami kei be la .teris.**
>
> *The concept of people loving each other, as Terry conceives it.*

Indirect Questions with kau

Recall from Chapter 6 that **kau** marks the questioned element in an indirect question. The containing abstractor is usually **du'u**:

> **mi djuno le du'u ma kau klama**
>
> *I know who is going.*
>
> (ma kau = the questioned element)

> **mi djuno le du'u xu kau do klama**
>
> *I know whether you are going.*

> **mi na djuno le du'u do klama ma kau**
>
> *I don't know where you are going.*

Without **kau**, the question word is direct. With **kau**, the whole thing becomes an embedded indirect question.

Why kau? Inside **le du'u**, a bare **ma** (or other question fragment) still parses as a **direct** question — *Who is it that I know goes?* — not as an indirect "I know who goes." **kau** marks the questioned piece as *the answer sought* in the embedded reading.

Sometimes you can avoid kau: when the questioned part is a **sumti**, **djuno**'s **fi** place can carry "what is known about X":

> **mi djuno fi le pu klama be le zarci**
>
> *I know something about the past goer to the store*
>
> — often glossed as *I know who went._

That paraphrase is loose: the listener must infer that **identity** is what is known, not (say) the person's shoe size. When the questioned bit is **not** a *sumti* — for example, a connection or operator — **le du'u … kau** is usually the only clean option.

Sumti Raising: tu'a and jai

Sometimes a *gismu*'s place structure requires an *event* or *property* abstraction, but you want to use a plain *sumti*. **tu'a** and **jai** help bridge this gap.

/ **tu'a** — "some event or fact about [*sumti*]":

An informal *sumti*-raiser. Instead of constructing a full abstraction, wrap the relevant *sumti* in **tu'a**:

> **mi djica tu'a do**
>
> *I want something involving you.*
>
> (≈ I want you to do something)

> **mi djica le nu do klama** (full version)
>
> *I want the event of you coming.*

tu'a do ≈ **le nu do co'e** (some unspecified event about you). It's much shorter and is natural in speech.

> **mi troci tu'a le kabri**
>
> *I try something with the cup.*
>
> (≈ I try to lift / fill / clean it — context decides)

/ **jai + modal** — the precise alternative:

jai promotes the *tag argument* of a modal to x_1 of the *selbri*. This is the formal mechanism behind *sumti*-raising:

> **le nu mi djica cu jai mu'i klama fai mi**
>
> *My wanting is the motivation for the going, which I do.*

Here the event "my wanting" is raised to x_1, and the original x_1 (mi) is displaced to **fai** (the special place created by jai). In practice, **tu'a** handles most casual *sumti*-raising; **jai** is for precise grammatical control.

Lojban Sumti Raising with ni and li'i

Two other abstractors interact with *sumti*-raising:

/ **ni** — "the amount/degree that":

Used with quantity-predicates like **barda** (big), **melbi** (beautiful), **zmadu** (exceeds):

> **le ni le zdani cu barda**
>
> *the amount of the house's bigness*
>
> = the house's size

> **mi zmadu do le ni mi barda**
>
> *I exceed you in the amount that I am big.*
>
> = I am bigger than you.

This is Lojban's way of making scalar comparisons exact.

/ **li'i** — "the experience of":

Abstracts a *subjective experience*:

> **le li'i mi cortu cu pluka nai**
>
> *The experience of my being in pain is not pleasant.*

li'i is used when the *experiential quality* matters, not just the event.

x_2 place: x_1 is the experience of [*bridi*]; x_2 is the experiencer. Example with **kei be**:

> **mi morji le li'i mi verba kei be mi**
>
> *I remember my experience of being a child.*

---

su'u: The General Abstractor

su'u is a "catch-all" abstractor — it abstracts without specifying *what kind* of abstraction applies. Its unique feature is an x_2 place that lets you specify the abstraction type explicitly:

> x_1 is the [x_2-type] abstraction of [
>
> *bridi*
>
>]

Examples:

> **le su'u le ci smacu cu bajra**
>
> *The abstract nature of the three mice running.*
>
> (type unspecified — "See how they run!")

> **le su'u mi klama kei be lo fasnu**
>
> *The event-abstraction of my going.*
>
> (x_2 = **lo fasnu** specifies it's an event, same as **le nu mi klama**)

su'u can substitute for any other abstractor when you want to be vague or when no existing abstractor fits:

> **le su'u la .iecuas. cu jmive**
>
> *The abstract nature of Jesus's living.*
>
> (neither event, property, nor amount — something more like "the mystery/fact of")

Important: when filling the x_2 place, use **kei be** to close the abstraction *bridi* first:

> **le su'u mi klama kei be lo fasnu** ✓ **le su'u mi klama be lo fasnu** ✗ (the **be** attaches inside the
>
> *bridi*
>
> , modifying **klama**)

The same **kei be** pattern applies whenever you specify **x_2** on **su'u**, **si'o**, or **li'i** (and similarly for other abstractors with an outer **be**): without **kei**, **be** is read as part of the inner *bridi*, not as tagging the abstractor's second place.

Event Abstractors and ZAhO Tenses

The four NU event-type abstractors (**nu**, **pu'u**, **za'i**, **zu'o**, **mu'e**) have a systematic correspondence with the ZAhO event-contour tenses. The ZAhO *cmavo* describe *which phase* of an event the *bridi* refers to.

The ZAhO *cmavo*

cmavo	Type	Meaning
pu'o	span	before the event begins (anticipatory)
ca'o	span	while the event is ongoing
ba'o	span	after the event ends (retrospective)
co'a	point	at the starting edge of the event
co'u	point	at the ending edge of the event
de'a	point	at a temporary stop (pause)
di'a	point	at a resumption after a stop
mo'u	point	at the natural completion point
za'o	span	after natural end but before actual end (excessive/superfective)
co'i	point	the whole event as a single achievement

Which ZAhO apply to which event types

Not all ZAhO make sense with all NU types:

Event type	Applicable ZAhO
pu'u (process)	all of them — processes have full internal structure
za'i (state)	**pu'o**, **ca'o**, **ba'o**, **co'a**, **co'u**, **co'i** (no natural end ≠ actual end)
zu'o (activity)	**pu'o**, **ca'o**, **ba'o**, **co'i** (cycling: start/end not sharp)
mu'e (point-event)	**pu'o**, **ba'o**, **co'i** (no duration: no **ca'o**)

Examples in use:

> **mi co'a citka le sanmi**
>
> *I start eating the meal.*

(**co'a** = beginning edge of the eating event)

mi ca'o citka le sanmi

I am in the middle of eating the meal.

(**ca'o** = ongoing process)

mi ba'o citka le sanmi

I have finished eating the meal.

(**ba'o** = after-the-event perspective)

mi za'o citka le sanmi

I am still eating the meal past its natural end.

(**za'o** = excessive continuation)

mi co'i citka le sanmi

I eat the meal.

(as a completed achievement; the whole event as a point)

The ZAhO tenses are placed in the normal tense slot before the *selbri*. They can be combined with PU tenses:

mi pu co'a citka

I had just started eating.

(in the past, at the starting edge)

Abstractor Connection

Abstractors themselves can be connected with logical connectives, just like *selbri*:

le nu joi ka la .alis. cu klama

the event and/or property of Alice's going

Purely **logical** connection between abstractors of the same type is also possible — two events, two properties, etc.:

> **le nu mi cadzu .e le nu do bajra**
>
> *the event of my walking **and** the event of your running*

joi (non-logical connective: "combined mass") combines two abstractions:

> **le nu .e ka do cadzu**
>
> *the event and property of your walking*

This is advanced and rare, but useful when you need to speak about multiple aspects of the same *bridi* simultaneously.

Comparative *lujvo* (-mau, -me'a)

"More than" / "less than" often use *lujvo* ending in **-mau** (**zmadu**) and **-me'a** (**mleca**) instead of bare **zmadu**/**mleca** — the places are easier to fill.

> **mi citmau do lo nanca be li xa**
>
> *I am six years younger than you.*
>
> (**citno** + **zmadu**)

> **do citme'a mi lo nanca be li xa**
>
> *You are six years less young than me.*
>
> (parallel **mleca** form)

Packed comparatives like **nelcymau** (like-more) and **klamau** (go-more) follow regular place conventions: the two things compared usually line up with the first places of the embedded relation. The forms and their places:

For "more than before" without naming a rival, use increase/decrease (**zenba**, **jdika**) rather than an empty **zmadu** second place. Compare:

> **mi ca tsamau**
>
> *I'm stronger now*
>
> — but **tsamau** is still a **-mau** comparative; z_2 is often read as "than

> *someone*
>
> ," not "than before."

> **mi ca tsaze'a**
>
> *I increase in strength.*
>
> →
>
> *I'm stronger now*
>
> (no unnamed rival).

traji superlatives (**citrai**, **balrai**, ...) pick the extreme member of a set:

> **la djudis. cu citrai lo'i lobypli**
>
> *Judy is the most expert Lojbanist.*

> **la .ainctain. cu balrai lo'i skegunka**
>
> *Einstein is the greatest scientist.*
>
> Tanru-style comparatives in depth: Chapter 15.

Comparative *lujvo* (-mau, -me'a)

Summary of NU Abstractors

Abstractor	Type	Meaning	Common use
nu	event (general)	x_1 is the event/state of [*bridi*]	like, see, cause
mu'e	point-event	x_1 is the achievement of [*bridi*]	crimes, instants
pu'u	process	x_1 is the process of [*bridi*]	history, change
zu'o	activity	x_1 is the activity of [*bridi*]	exercise, habits
za'i	state	x_1 is the state of [*bridi*]	conditions
ka	property	x_1 is the property [*bridi*] (ce'u = open slot)	quality comparison
ni	amount	x_1 is the amount of [*bridi*]	measurement, degree
du'u	proposition	x_1 is the proposition that [*bridi*]	know, believe, say
jei	truth value	x_1 is the truth of [*bridi*]	know whether
si'o	concept	x_1 is the idea of [*bridi*]	mental content
li'i	experience	x_1 is the experience of [*bridi*]	subjective sensation

Key rules:

- Abstractions are closed by **kei** (elidable at end or before **cu**)
- **ce'u** marks the open slot in **ka** (and sometimes **ni**) abstractions
- Use **du'u** for knowing/believing/saying; **nu** for events you perceive/cause
- **kau** in a **du'u** abstraction creates an indirect question
- **tu'a** = quick *sumti*-raiser (some event about [X]); **jai** = precise promotion via modal

su'u — the general/vague abstractor:

- x_1 is the [x_2-type] abstraction of [*bridi*] — type specified in x_2
- Use when no other NU fits, or to be deliberately vague about abstraction type
- **kei be** required to close the *bridi* before filling x_2: **le su'u ... kei be lo fasnu**
- **du'u** also has an x_2 (linguistic expression); see **le se du'u** above

ZAhO event contours (tense aspect particles):

- **pu'o** = before event; **ca'o** = during; **ba'o** = after
- **co'a** = starting edge; **co'u** = ending edge; **co'i** = whole event as point
- **de'a** = temporary pause; **di'a** = resumption; **mo'u** = natural end; **za'o** = past natural end
- Combine with PU: **pu co'a** = had just started
- ZAhO applicability by event type: **pu'u** (process) takes all; **za'i** (state) no **za'o/mo'u**; **zu'o** (activity) no sharp start/end; **mu'e** (point) no **ca'o**

Chapter 13. Negation & Logic

Two Kinds of Negation

English "not" is slippery. Consider:

> *John didn't go to Paris from Rome.*

Does this mean he went somewhere else instead of Paris? That he departed from somewhere other than Rome? That he didn't travel at all? English doesn't say.

Lojban separates these into two distinct systems:

1. **Bridi negation** (**na**) — contradictory negation, denies the whole claim
2. **Scalar negation** (**na'e**, **no'e**, **to'e**) — says the value is "other than" the stated one

---

na: Bridi Negation

na before the *selbri* negates the *entire bridi* — making a clean logical contradiction:

> **mi klama le zarci**
>
> *I go to the store.*
>
> *(true)*

> **mi na klama le zarci**
>
> *It is not the case that I go to the store.*
>
> *(the whole claim is false)*

na has exactly one meaning: *the* bridi *is false*. If the *bridi* was true, **na**-*bridi* is false; if the *bridi* was false, **na**-*bridi* is true. This is classical contradictory negation.

na goes right before the *selbri* (after **cu** if present):

> **mi cu na klama le zarci**
>
> *(legal)*
>
> **mi na cu klama le zarci**

> *(legal — na can precede cu)*

na can appear inside abstraction *bridi* too:

> **mi na gleki le nu mi klama le zarci**
>
> *I am not happy about the event of going to the store.*

> **mi nelci le na melbi**
>
> *I like the one who is not beautiful.*

Double negation cancels out:

> **mi na na klama** = **mi klama**
>
> *I do go.*
>
> (na na = positive)

---

na vs. no

Don't confuse **na** (*bridi* negation) with **no** (the number zero) or **no'e** (scalar mid-point). They are entirely different particles.

---

na'e: Scalar Negation

na'e before a *selbri* or *brivla* says "other than [X]" — some different value on the same scale applies:

> **mi na'e klama le zarci**
>
> *I do something other than go to the store.*
>
> (maybe I stay near it, circle it, etc.)

This is *not* the same as **na**! **na'e klama** says a different relation holds, not that nothing holds. It's a positive assertion that some other going-related thing is true.

na'e inside *tanru* targets just the following word:

> **mi na'e cadzu klama le zarci**

> *I go to the store in a non-walking manner.*
>
> (still going, just not walking)

> **mi cadzu na'e klama le zarci**
>
> *I walk (but don't* go to*) the market.*
>
> (walking is involved, destination is different)

To negate a whole *tanru*, use **na'e ke ... ke'e**:

> **mi na'e ke cadzu klama ke'e le zarci**
>
> *I do something other than (walk-go) to the market.*

The Scalar System: na'e, no'e, to'e

Lojban provides three levels on a scale:

	Particle	Position	Meaning	
	(implied positive)	extreme end	fully applies	
	na'e	"other than"	somewhere else on scale	
	no'e	midpoint	neutral / middle	
	to'e	opposite end	polar opposite	

> **mi melbi** —
>
> *I am beautiful.*
>
> **mi na'e melbi** —
>
> *I am other-than-beautiful.*
>
> (could be ugly, neutral, or something else) **mi no'e melbi** —
>
> *I am medium-attractive.*
>
> (neutral) **mi to'e melbi** —
>
> *I am ugly.*

(explicit opposite)

le zarci cu barda —

The store is big.

le zarci cu no'e barda —

The store is medium-sized.

le zarci cu to'e barda —

The store is small.

to'e asserts the polar opposite, so it's a strong positive claim. **na'e** is vaguer — it just says "not this point."

---

nai: Attitudinal Negation

In attitudinals (Chapter 7), **-nai** is a suffix that inverts the attitudinal:

.ui — happiness ⟶ **.uinai** — unhappiness **.ai** — intent ⟶ **.ainai** — lack of intent / indecision

This is a separate particle from **na** and **na'e** — it only applies inside attitudinals and logical connectives.

Negation in Questions

xu asks whether the *bridi* is true (Chapter 6). Answers reuse the same *bridi* with **na** or abbreviate with **go'i**.

Straight question, negative answer:

xu la .djan. pu klama

Did John go?

na go'i

No

— expands to **la .djan. na pu klama** (John didn't go).

You may shift tense in the answer; **na** and the tense can appear in either order, which can change scope (see below):

na ba go'i ≈ la .djan. na ba klama —

No — he won't go.

ba na go'i ≈ la .djan. ba na klama —

No — later [it is false that] he goes.

(subtle ordering effects)

Scalar "no": na'e go'i = "other than the previous" — e.g. John didn't *go*, he *called* (equivalent to putting **na'eke** after the tense before **klama**).

Negative questions: xu na … and ja'a go'i

If the question itself contains **na**, a bare **go'i** repeats **including** the **na** — it does **not** mean "yes" in English sense:

xu la .djan. na pu klama

Is it true that John didn't go?

go'i

[Repeats:] John didn't go.

— affirms the negative question (often what English calls "yes, he didn't").

To assert the positive *bridi* instead, replace **na** with **ja'a** (same place **na** would occupy):

ja'a go'i

John did go.

— **ja'a** is the affirmative counterpart of **na** (Pragmatic Negation: ja'a below).

So: **xu na go'i** ↔ "Is it false that …?"; answer with **ja'a go'i** when the underlying claim is true, not plain **go'i**.

Scope of na

na always negates the *entire bridi* in which it appears. It does not narrow to just one *sumti* or one piece of the *selbri*. When you need to negate just a slot's content, put the negation in an inner *bridi*:

mi na klama le zarci ki'u le nu le karce cu spofu This negates the whole sentence "I go to the store because the car is broken" — saying the whole thing is false.

But if you want to say "I don't go because the car is broken (though I don't go for other reasons)":

le nu mi na klama le zarci cu se krinu le nu le karce cu spofu

The event of my not-going to the store is caused by the car being broken.

Here **na** is inside the event abstraction, not at the top level.

Negation and Quantifiers

Negation interacts with quantifiers in important ways. Full logical quantifier negation is covered in Chapter 16, but the basics:

lo gerku cu na blabi —

Some dogs are not white.

(true in general) **na ku lo gerku cu blabi** —

It is not the case that [any] dog is white.

(claims NO dogs are white)

The position of **na** relative to quantifiers changes the logical meaning drastically. This is the classic scope-of-negation problem that Lojban handles precisely.

Pragmatic Negation: ja'a

ja'a is the explicit *affirmative* particle — "indeed, truly":

mi ja'a klama —

I indeed go.

(emphatic yes)

It's mostly used to explicitly undo a previous negation or to provide strong contrast:

> **do na klama .i mi ja'a klama**
>
> *You don't go. I do go.*

ja'a belongs to the same selma'o NA as **na**, and serves as its explicit opposite.

With **go'i**, **ja'a** *replaces* a **na** in the repeated *bridi* — essential for answering **xu na ...** with a positive fact (Truth questions above).

Sumti Negation

So far we've seen how to negate the **bridi** (the whole claim) and how to negate a **selbri** (scalar negation). Lojban can also negate a **sumti** — specifically, negate what fills a numbered place.

The main tool is **naku** (or **na ku**) before a *sumti*. It shifts the negation to bind the following quantified *sumti*:

> **mi klama naku le zarci**
>
> *I go to a non-store.*
>
> (what I go to is not a store)

More precisely, quantifier negation with **naku** works like prenex logic. Pushing **naku** leftward past a quantifier reverses the quantifier:

> **mi viska no le prenu = mi na viska ro le prenu**
>
> *I see none of the people.*
>
> =
>
> *It's not the case that I see all of them.*

Numbers as quantifiers can express *sumti* negation directly:

> **mi klama le no zarci** — impossible (there are zero stores to go to) **mi na klama le zarci** — I don't go to the store (
>
> *bridi*
>
> negation)

The difference matters with existential claims:

lo no gerku cu blabi — no dog is white (zero dogs fit) — effectively "there are no white dogs" **na ku lo gerku cu blabi** — it's not the case that some dog is white (same, different logical form)

na'i: Metalinguistic Negation

na'i is the *metalinguistic* negation — it signals that something is wrong with what was just said, not that the *bridi* is false:

do'u na'i

Something wrong just happened

(the utterance had a false presupposition, grammatical error, or category mistake)

xu do klama le zarci .i na'i le zarci cu se klama

Are you going to the store? — [False presupposition:] The store is somewhere one goes.

(correcting the frame, not just answering no)

na'i contrasts with **na**:

- **na** = the *bridi* is false (contradictory negation)
- **na'i** = something about the utterance is wrong — a presupposition fails, a category is confused, or the question doesn't apply

mi bilma .i do pu'i jbena na'i

I am sick. You were born, [metalinguistically negated — something is off with that claim].

na'i is used in discourse as a polite way to say "I'm not disagreeing with the facts, but the framing is wrong."

naku: Negation Scope and Quantifier Interaction

The full treatment of **naku** shows how it interacts with quantifiers in a prenex:

naku ro da poi prenu cu morsi = su'o da poi prenu zo'u da na morsi

Not everyone dies.

=

Some person doesn't die.

The key rule: **naku** before a universal quantifier reverses it to existential (and vice versa):

	Statement	Equivalent	English	
	naku ro da broda	**su'o da na broda**	not everything is broda = something isn't	
	naku su'o da broda	**ro da na broda**	nothing is broda = everything isn't	

This is De Morgan's law for quantifiers — covered more thoroughly in Chapter 21.

naku outside a prenex moves the scope of negation earlier in the sentence, letting it bind more:

mi na klama le zarci —

bridi

negation (I don't go to the store) **naku mi klama le zarci** — same semantics, but the na is fronted for emphasis or scope clarity

In complex nested *bridi*, the exact position of **na** vs. **naku** changes what is negated. When in doubt, use the prenex form with **naku** to make scope fully explicit.

Sumti Negation: na'ebo

Just as **na'e** applies scalar negation to a *selbri*, **na'ebo** applies it to a *sumti* — the argument, not the predicate.

na'ebo le gerku cu batci mi

Something other than the dog bites me.

The **na'ebo** targets the *sumti* **le gerku** and asserts that something *other than* what that *sumti* describes is the correct x_1. It makes a positive assertion: something else does the biting, though we don't say what.

By contrast, to negate the *sumti* with a zero quantifier (contradictory negation):

no le gerku cu batci mi

None of the dogs bite me.

This is contradictory: it simply says the count is zero. **na'ebo** is scalar: something *other than* a dog is involved.

You can also use **no'ebo** (neutral) and **to'ebo** (opposite) on *sumti*:

> **mi klama to'ebo la .bastn.**
>
> *I go to the opposite of Boston.*
>
> (the antipodal city)

These are relatively rare but useful in precise discourse.

Specifying the Scale in Scalar Negation

When you use **na'e**, **no'e**, or **to'e**, the scale being used is usually implied by context. Sometimes you need to be explicit. The *sumti* tcita **ci'u** (*on a scale of X*) can be attached to the negated *selbri* with **be**:

> **le stizu cu na'e xunre be ci'u loka skari**
>
> *The chair is non-red on the scale of color-ness.*

This explicitly identifies that **xunre** is being negated within the color scale, ruling out interpretations where "other than red" might mean "other than the chair being red in general."

For **to'e** (polar opposite), the scale is particularly important:

> **ta to'e melbi**
>
> *That is repulsive/very ugly.*
>
> (the opposite end of the beauty scale)

> **ta no'e melbi**
>
> *That is plain/ordinary-looking.*
>
> (the neutral midpoint)

The *rafsi* for these NAhE particles let them appear in *lujvo*:

- **-nal-** from **na'e** (non-)
- **-nor-** from **no'e** (neutral-)
- **-tol-** from **to'e** (opposite-of-)

Examples: **nalmle** (non-beautiful), **tolmle** (ugly/repulsive), **normle** (plain-looking).

---

nai on Interval Modifiers: Scalar vs Contradictory

The suffix **-nai** behaves differently depending on what it is attached to:

On tenses and modals (PU, BAI): **nai** is *contradictory* — it simply negates the tense:

> **mi punai klama le zarci**
>
> *I [not-past] go to the store.*
>
> (= it is not the case that I went)

This is equivalent to **mi na pu klama le zarci**.

On TAhE, ROI, and ZAhO (interval and aspect particles): **nai** is *scalar* — it says the specified frequency/phase is not accurate, but does not say zero:

> **mi paroinai dansu le bisli**
>
> *I [once-not] dance on the ice.*
>
> *I dance on the ice either zero times or two-or-more times within this period.*

This is very different from English "not once" (which means never). In Lojban, **paroinai** only rules out "exactly once."

> **mi ca'onai citka**
>
> *I am [not in-the-middle-of] eating.*
>
> (= I'm not currently in the eating process)

On attitudinals (UI, CAI): **nai** is polar — it takes the attitudinal to the opposite end of its scale:

> **.uinai** — unhappy (opposite of **.ui** happy) **.ienai** — disagree (opposite of **.ie** agree)

---

naku and Tense: Scope Order Matters

When **naku** appears in the same *bridi* as a tense marker, their *order* determines meaning. **na** (or **naku**) and tense are in the same structural position (before the *selbri*), and whichever comes *first* has wider scope:

Tense outside negation: naku inside pu

mi pu na klama le zarci

I [in-the-past] [not-went] to the store.

= Past is asserted; what is negated is the going. Meaning: There was a past moment at which I was not-going to the store.

Negation outside tense: naku wraps pu

mi na pu klama le zarci

It is not the case that [I past-went] to the store.

= The whole past-going claim is false. Meaning: I did not go to the store in the past. (No past-going event exists.)

These two can have different truth conditions in edge cases:

- **pu na klama**: there was a time when I was in a non-going state (compatible with "I went later")
- **na pu klama**: there is no past event of going at all (stronger)

The general rule: whichever scoping element (tense or negation) appears *earlier* in the spoken/written sentence takes *wider* scope over what follows it.

This matters most in:

- Quantified *bridi* with tense: **ro le prenu pu na klama** vs. **na ro le prenu pu klama**
- Modal + negation: **mu'i le nu … na …** (the modal is outside the negation) vs. **na … mu'i le nu …** (negation is outside the modal's scope)

When scope is ambiguous, use a **prenex** to make it explicit:

pu zo'u naku ro da broda

In the past: not all things are broda

(pu outside, naku inside the prenex)

naku zo'u pu ro da broda

It is not the case that [in the past all things are broda]

(naku outside, pu inside)

---

nai on Abstractors

The NU abstractors can also take **-nai**, forming negated abstractions that can be joined with logical connectives:

su'u jenai ni — the property, but not the measure

This construction parallels **punai je ca** = **pu naje ca** for tenses: compound abstractors can carry **-nai** on one arm the same way tenses do. Logically connected abstractors with negation are rare outside technical prose.

Negation of other grammatical pieces (quick inventory)

CLL groups every use of **nai** that is *not* ordinary **na** *bridi* negation. Most of these are already covered above or in Chapter 8; this is a **roadmap**:

Construct	**nai** effect	Where
PU / **BAI** (tense, modal)	Contradictory: not that tense/modal	§ **nai** on interval modifiers (PU/BAI), Ch.9–10
TAhE / **ROI** / **ZAhO**	Scalar: not *exactly* that frequency/phase	Same section
UI / **CAI**	Polar opposite on the scale	Ch.7
COI (vocatives)	Opposite protocol slot; **je'enai** = "not understood"	Ch.7
NU abstractors	Negated abstraction type in compounds	§ **nai** on abstractors
JOI / **BIhI** (non-logical connectives)	Scalar: not this mixture/join; another relation fits	Ch.8 — non-logical connectives
Logical connectives (**ijek**, **jek**, …)	**na** / **nai** on the vowel → 16 truth functions	Ch.8, Ch.16

Affirmations

Besides **ja'a** (NA — *bridi* affirmation), Lojban uses UI-family affirmations:

/ **je'a** — scalar affirmation (UI):

A discourse particle expressing that something is *definitely* the case, stronger than the default. Roughly "certainly" or "indeed so":

je'a go'i — Yes, indeed (stronger than just **go'i**)

/ **jo'a** — metalinguistic affirmation (UI):

Asserts that an expression is being used correctly or that a framing is appropriate, countering a **na'i** challenge:

na'i — Something is wrong with how this was said / the framing is off.
jo'a — No, the framing is appropriate.

je'a and **jo'a** are used at the discourse/attitude level rather than as logical operators on truth values.

Summary

Particle	Type	Meaning
na	*bridi* negation	entire *bridi* is false (contradictory)
ja'a	*bridi* affirmation	entire *bridi* is asserted (emphatic)
na'e	scalar negation	other-than the stated value
no'e	scalar midpoint	neutral / middle of scale
to'e	polar opposite	explicit opposite of stated value
-nai suffix	attitudinal negation	inverts attitudinal
naku	scope negation	negates with quantifier interaction
na'i	metalinguistic negation	something wrong with the utterance/framing

Key rules:

- **na** = whole *bridi* is false; **na na** = double negation = positive
- **na'e** = some *different* value holds (positive assertion of difference)
- **to'e** = specifically the opposite end of the scale
- Put **na** *before* the *selbri*; put **na'e** *before* the word it targets
- Scope of **na** is the entire *bridi*; use **na'e ke...ke'e** for *tanru*-scope scalar negation
- **naku** + universal quantifier = existential with **na** (De Morgan swap)
- **na'i** = metalinguistic, not logical — the framing itself is challenged
- **Truth questions: na go'i** = no; **xu na ...** + **go'i** affirms the negative; use **ja'a go'i** to assert the positive *bridi*
- **Minor nai:** see quick inventory table — PU/BAI vs TAhE/ROI/ZAhO vs UI vs JOI/BIhI vs logical connectives

Sumti negation:

- **no lo ...** = contradictory *sumti* negation (zero quantification)
- **na'ebo** = scalar *sumti* negation: "something other than [*sumti*]" (positive assertion)
- **no'ebo** = neutral *sumti*; **to'ebo** = opposite *sumti*

Scale specification:

- **ci'u** (on a scale of X) explicitly names the scale for **na'e/no'e/to'e**: **na'e xunre be ci'u loka skari**

nai suffix behavior:

- On PU/BAI tenses and modals → *contradictory* (simple negation)
- On TAhE/ROI/ZAhO interval/aspect particles → *scalar* (the specified frequency/phase doesn't hold, but not zero)
- On UI/CAI attitudinals → *polar* (opposite end of emotional scale)
- On NU abstractors → negated abstraction type; can be connected with logical connectives

Affirmations:

- **ja'a** = *bridi* affirmation (emphatic positive; counterpart of **na**)
- **je'a** = scalar affirmation (UI): "indeed/certainly so" — stronger than default
- **jo'a** = metalinguistic affirmation (UI): "the framing is correct" — counters **na'i**

Chapter 14. Morphology & *lujvo*

Three Word Classes

Every Lojban word belongs to exactly one of three classes, identifiable by its shape alone:

/ **cmavo** — structure words:

Short particles with no consonant clusters: **cu**, **le**, **mi**, **pu**, **je**, **lo**, **.i**. They handle grammar — articles, conjunctions, tense markers, etc. Forms: V, CV, VV, CVV.

/ **brivla** — predicate words:

Content words that end in a vowel and contain a consonant pair within the first five non-**y** letters. Three subtypes: *gismu*, *lujvo*, fu'ivla.

/ **cmene** — proper names:

End in a consonant (hence always followed by a pause): **la .teris.**, **la .alis.**, **la .lojban.**.

This three-way distinction is unambiguous: you can always tell which class a word belongs to by looking at (or hearing) its shape.

Recognizing words in a stream

When **splitting** continuous Lojban text or speech into words, use **morphology first** (same tests as the parser):

1. **Pauses and quotes** — A **.** before a vowel-initial word is a real pause; **la** before a name requires pauses around **cmene**; **'** between vowels is /h/. (See Chapter 19.)
2. **cmene** — Ends in a consonant; must be wrapped in pauses (and usually **la**).
3. **cmavo** — No consonant cluster; shapes **V**, **CV**, **VV**, **CVV** (and some longer compounds like **cui**, **nai**). If it could be **cmavo** or the start of **brivla**, the next letters decide.
4. **brivla** — Has a **permissible consonant pair** in the first five letters (counting only non-**y** letters) and ends in a vowel.

ZOI / **lo'u** quotations and other non-Lojban fragments follow their own rules — see Chapter 17. For the full decision procedure, see the **Word Recognition** section in this chapter below — it covers the boundary cases you will actually encounter when reading.

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gismu: Root Words

The ~1350 **gismu** are Lojban's primitive vocabulary. They are always exactly five letters long, always start with a consonant, always end in a single vowel, and always stress the first (penultimate) syllable.

Two shapes:

- **CVC/CV** — e.g. **klama**, **prenu**, **bridi**
- **CCVCV** — e.g. **blanu**, **tricu**, **mlatu**

Each *gismu* comes from sounds in the six most-spoken natural languages (Mandarin, English, Hindi, Spanish, Russian, Arabic), blended to maximize recognizability across language backgrounds.

Examples:

gismu	Meaning
klama	go/come (x_1 goes to x_2 from x_3 via x_4 by means x_5)
prenu	person
blanu	blue
melbi	beautiful
cukta	book
mamta	mother
patfu	father
gerku	dog
mlatu	cat
zdani	home/nest

No two *gismu* differ only in their final vowel (ensuring they can't be confused). Gismu are the building blocks for all compound words.

rafsi: Word Pieces

Each *gismu* has 2–5 **rafsi** (combining forms) used to build compound words. Rafsi are *not* standalone words — they only appear inside *lujvo*.

Complete *rafsi* shape typology:

Shape	Letters	Example	Notes
CVC	3	**kla-**, **ber-**	Short *rafsi*; most common
CCV	3	**bla-**, **kla-**	Short; only for *gismu* starting with CC
CV'V	3+apost.	**ka'a**, **se'i**	Short; vowel pair with h-sound
CVV	3	**kai**, **mau**	Short; vowel diphthong
CCVC	4	**klam-**	Long *rafsi* = *gismu* minus final vowel
CCVCV	5	**klama**	Long *rafsi* = the full *gismu* (only at end of *lujvo*)

Not every *gismu* has all six shapes — it depends on whether the *gismu* begins with CC, has a CV'V sequence, etc. Each *gismu* has at minimum a 4-letter and 5-letter long *rafsi*.

The tosmabru test:

When two CVC *rafsi* are joined, the result might accidentally look like a valid *brivla* starting at the wrong boundary. The test: if removing the final vowel of the whole *lujvo* and leaving the first five letters results in something that parses as a *brivla*, insert a **y** hyphen after the first CVC *rafsi*.

The test is named after the example: **tosybau** (one's-own-language — from **tosto** + **bangu**). Without **y**, **tosbau** is correct, but if the combination were **tosmabru** (animal species — **tosto** + **mabru**), the parser could split it as **tos-** + **mabru** (a *gismu*). The **y** prevents this: **tosymabru**.

In practice: whenever you join two CVC *rafsi* where the combined CC cluster at the join would be illegal *or* ambiguous, insert **y**. The *lujvo*-scoring algorithm tells you when this is needed.

Common *rafsi* for frequently used *gismu*:

gismu	Short *rafsi*
klama	kla, ka'a
prenu	pre
blanu	bla
melbi	mel, mle
mamta	mam
patfu	paf, pa'u
zmadu	zma, mau
mlatu	mla
gerku	ger, ge'u
zdani	zda

lujvo: Compound Words

A **lujvo** is built by chaining *rafsi* together. It encodes a *tanru* (metaphorical combination) as a single unambiguous word with a fixed definition.

Process:

1. Identify the *tanru*: e.g. **skami pilno** (computer user)
2. Find *rafsi*: skami → **sam-**, pilno → **pli** or **-pilno**
3. Chain: **sampli** (computer-user)

More examples:

Tanru	Lujvo	Meaning
barda bloti	**barbloti**	ship (big boat)
mamta patfu	**mampa'u**	maternal grandfather
zdani mlatu	**zdamlatu**	house cat
bridi valsi	**brivla**	predicate word
zunle jamfu	**zuljma**	left foot
skami pilno	**sampli**	computer user

Unlike *tanru* (which are semantically vague), each *lujvo* has one specific fixed meaning. When you dictionary-define a *lujvo*, you lock in *which* interpretation of the underlying *tanru* it means.

Hyphen Letters

When chaining *rafsi*, consonant clusters must be maintained and the result must parse as a single word. Lojban uses letter hyphens to ensure this:

y-hyphen: inserted after a CVC *rafsi* when needed to prevent an illegal consonant cluster or word-boundary ambiguity:

> **pante tavla** → **patyta'a** (not **patta'a** — *tt* is illegal)

> **mudri siclu** → **mudysiclu** (not **mudsiclu** — would split)

r-hyphen / n-hyphen: inserted after CVV *rafsi* to create a needed consonant cluster:

> **soi** + **sai** → **soisai** would be two *cmavo* → **soisai** needs **r**: **sorsai** (using r-hyphen)

> When following *rafsi* starts with **r**, use **n** instead: **ro'i** + **re'o** → **ro'inre'o**

---

zei: Ad-hoc *lujvo*

When you need to form a *lujvo*-equivalent from words that have no *rafsi* (especially *cmavo* or fu'ivla), use **zei** as a joiner:

> **bridi zei valsi** = **brivla** (exact equivalent)

> **by. zei livgyterbilma** = B-disease (where **by.** is the letter B)

zei lets you create compound predicates from any words, including borrowed terms.

---

fu'ivla: Borrowed Words

fu'ivla (copy-words) are loanwords for concepts that don't fit neatly into Lojban's *gismu* system — biological species, foods, technical jargon, cultural terms.

The four formal stages:

Stage	Form	Example for "spaghetti"	Notes
1	Raw foreign word in **la'o** quote	**la'o gy.spaghetti.gy.**	Always works; no Lojbanization needed
2	Lojbanized as a cmene (name)	**la spagetis.**	Treated grammatically as a name, not a predicate
3	Lojbanized *brivla* with *rafsi* prefix	**spagetis** (rare) or *rafsi*-prefixed	The standard fu'ivla; must have *brivla* morphology
4	Full *lujvo* with fu'ivla as component	e.g. **cidja-spagetis**	Rarely used

Stage 3 structural requirements (the most important):

A stage 3 fu'ivla must:

1. Pass the *brivla* morphology test — it must look like a *gismu* or *lujvo* (not a *cmavo* or cmene).
2. Have a consonant cluster within the first five letters (to distinguish it from *gismu* length).
3. End in a vowel.
4. Not accidentally parse as an existing Lojban word.

Since many borrowed words don't naturally have a CC cluster early, a **rafsi prefix** is prepended to force the shape. The *rafsi* must end in a consonant, and the borrowed stem must begin with a consonant (so the join creates a CC cluster):

> **cac-** (
>
> *rafsi*
>
> of **cacra**, hour) + **tus** → **cactus** is ambiguous; use **kokso** (coconut) built properly

> **tcati** — tea (from Chinese
>
> *chá*
>
> ; the initial **tc** cluster is native) **ckafi** — coffee (the **ck** cluster is provided by Lojbanization) **blaci** — glass (material)

If the foreign word doesn't naturally produce a CC cluster, prepend a meaningful *rafsi* as a classifier:

> **gri-** (
>
> *rafsi*
>
> of **grisi**, grease) → **grispolka** = polka (dance related to jumping)

The choice of *rafsi* is semantic — it hints at the word's domain — but is otherwise flexible.

Examples of common fu'ivla:

- **tcati** — tea
- **ckafi** — coffee
- **patxu** — pot
- **blaci** — glass (material)
- **mledi** — mold/fungus
- **xarju** — pig

Word Recognition Algorithm

Because of these strict morphological rules, any string of Lojban sounds can be *unambiguously segmented* into words without spaces. The shapes uniquely identify word boundaries:

- *cmavo*: short, no consonant cluster
- *gismu*: exactly 5 letters, consonant cluster, ends in vowel
- *lujvo*: 6+ letters, consonant cluster in first 5, ends in vowel
- cmene: ends in consonant (pause follows)

This means Lojban speech is unambiguous at the word level before you even consider meaning.

---

cmene: Lojbanization Rules in Detail

Lojban names (**cmene**) must end in a consonant and be surrounded by pauses. Beyond those basics, the full rules are:

Consonant clusters inside cmene: Every consonant pair inside the name must be *permissible* by Lojban phonology rules (the same rules as *gismu* and *lujvo*). Impermissible clusters require a buffer vowel (usually **y**, **i**, or **u**) inserted between them.

Names ending in a vowel: Add a consonant, typically **s** or **n**:

- Mary → **.meris.** or **.merin.**
- Joe → **.djos.**
- Sue → **.sus.**

Stress: The default is penultimate stress, but non-standard stress can be marked by capitalizing the stressed vowel:

- Ivan (stress on first syllable) → **.IVan.** or **.ivan.** (lowercase assumes pen-ultimate)
- A name like **.karlos.** naturally stresses *kar* (penultimate of the two syllables)

Lojbanization strategy:

1. Identify the source pronunciation (not spelling).
2. Map each sound to the nearest Lojban phoneme.
3. Resolve impermissible clusters by inserting buffer vowels.
4. Ensure the result ends in a consonant.
5. Add a pause mark (period) before and after.

Examples:

Source	Lojban form	Notes
John	**.djan.**	English /dʒɑn/ → dj+a+n
Alice	**.alis.**	straightforward
George	**.djordj.**	/dʒɔrdʒ/ → two dj clusters
Zhang	**.jang.**	Chinese /ʈʂɑŋ/ → j+a+ng
Smith	**.smiTs.**	th → ts; capital T marks stress
Nguyen	**.nguin.**	ng cluster is permitted

When a name could parse as a *brivla*: If a name's shape matches *brivla* morphology (CC cluster, ends in vowel), add a final consonant to force cmene parsing. For example, a character named *Prenu* ("Person") would need to be **.prenus.** to avoid being parsed as the *gismu* **prenu**.

Rules for Inserting Pauses

Pauses are mandatory (not just recommended) in seven situations:

1. **Before a cmene that begins with a vowel:** The vowel would otherwise attach to the previous word. Write a period (.) before the name: **.alis.**, **.ivan.**.
2. **After every cmene:** The final consonant needs a clear pause boundary: **la .djan.** not **la .djana**.
3. **Before and after SI/SA/SU (erasure words):** These words erase what came before; they must be clearly bounded to avoid erasing the wrong thing.
4. **After ZO (single-word quoter):** **zo** quotes the *immediately following* word; a pause after the quoted word ends the quotation: **zo .djan. cu cmene** = the word "john" is a name.
5. **Around ZOI and LA'O delimiters:** The delimiter word before and after the foreign text must be surrounded by pauses so the parser knows it's a delimiter, not regular speech.

6. **After text that ends in a consonant cluster (if the next word begins with a consonant):** To prevent the cluster from appearing to bridge into the next word.
7. **Around embedded non-Lojban text:** Before and after any foreign-language passage embedded in Lojban speech.

Lujvo Place Structures: Selecting What Matters

A *lujvo* is built from a *tanru*, but its **place structure** needs to be determined — which places of the component *gismu* should survive in the final *lujvo*?

The standard method: take the place structure of the **tertau** (the main *gismu*, the last in the *tanru*), then add important places from the **seltau** where needed.

Example: mamta patfu (maternal grandfather)

- **mamta** (mother): x_1 is mother of x_2
- **patfu** (father): x_1 is father of x_2
- The *lujvo* **mampa'u**: x_1 is a maternal grandfather of x_2

The x_2 place of mamta (the child) and x_2 of patfu (the child) *collapse* — they're the same thing. The *lujvo* absorbs both into one x_2.

Dependent places are places of the seltau that are already *determined* by a place of the tertau. They don't appear in the *lujvo*'s place structure because they're not independent:

> **balsoi** (great soldier, from **barda** + **sonci**)
>
> - **sonci** x_1 is a soldier of army x_2
> - **barda** x_1 is big
> - x_1 of barda is determined by x_1 of sonci (same entity)
> - So: **balsoi** x_1 is a great soldier of army x_2 — barda's place collapses

Symmetrical vs. asymmetrical *lujvo*:

In a **symmetrical** *lujvo*, both components contribute equally and the relationship is reciprocal:

> **datpre** (different person): x_1 is a person different from x_2 in x_3 (from **drata** + **prenu** — "other person" is symmetric: A differs from B ↔ B from A)

In an **asymmetrical** *lujvo*, one component modifies the other directionally:

> **balsoi** = great soldier (the bigness modifies the soldier, not vice versa)
> **zdamlatu** = house cat (the house constrains the cat's type)

Most *lujvo* are asymmetrical — the seltau narrows the tertau's meaning.

Comparatives and Superlatives

Lojban expresses comparison through specific *gismu* and BAI particles, not through inflection:

zmadu — x_1 exceeds x_2 in property x_3 by amount x_4 **mleca** — x_1 is less than x_2 in property x_3 by amount x_4 **dunli** — x_1 equals x_2 in property x_3

> **mi zmadu do le ka barda**
>
> *I exceed you in the property of being big.*
>
> = I am bigger than you.

> **le plise cu mleca le perli le ka titla**
>
> *The apple is less sweet than the pear.*

The **BAI** shorthand (same meaning as **zmadu** / **mleca**, but attaching to another *selbri*; **se** conversion is often clearer than bare **mau**/**me'a** — see Chapter 10):

> **mi zmadu do le ka barda**
>
> *I am bigger than you.*

> **mi mleca do le ka barda**
>
> *I am smaller than you.*

Compact comparative lujvo (**-mau**, **-me'a**) — **citmau**, **citme'a**, **nelcymau**, **klamau**, and friends — plus **zenba**/**jdika** for "more than before" and **traji**-based extremes (**citrai**, **balrai**), are spelled out with CLL pointers in Chapter 12 (section **Comparative lujvo**). This section's **zmadu** / **mleca** / **traji** material is the *tanru*-level companion.

Superlatives use **traji**. Places: x_1 = the extreme individual; x_2 = property (**ka**); x_3 = which extreme (defaults to "more", i.e. **ka zmadu**); x_4 = the comparison set.

> **le traji be le ka barda bei zo'e bei le'i prenu**
>
> *The one who is most big among the set of people.*

Relative clause (note **ke'a** for x_1 of **traji**, and **zo'e** for x_3 so x_4 can be the set):

> **le prenu poi ke'a traji le ka ce'u barda ku zo'e le'i prenu**
>
> *The person who is biggest among the people.*

The compound **verai** (from **ve** + **rai**) tags **traji**'s fourth place — "superlative among …" — and is often the clearest shortcut:

> **le prenu cu barda verai le'i prenu**
>
> *The person is biggest among the people.*

The bare **rai** *cmavo* tags **traji**'s *first* place ("with superlative …"); for "among a set", prefer **verai** or an explicit **traji** sentence.

Notes on *gismu* place structures

Unlike *lujvo* guidelines, **gismu** places were fixed **case by case** (the list is now frozen). A few pressures shaped them — the same ones that also influence sensible *lujvo* design:

Pressure	Effect
Brevity	Fewer places = easier to learn but less specific; *gismu* aim for **broad** coverage.
Convenience	Extra places avoid coining new *brivla* when a slot already fits a common need.
Metaphysical necessity	Keep a place only if it is *essential* to the concept; drop it if instances need not vary there.
Regularity	Related *gismu* tend to share parallel places (e.g. breed/species on animals).

Worked examples (CLL-style):

- **xekri** — only "x_1 is black": color is subjective; no "objective standard" place (**ci'u** or a *lujvo* can add one).
- **jbena** — time and location places exist so **le te jbena** / **le ve jbena** are simple terms (*birthday*, *birthplace*), even though tense tags usually carry time/place for other *bridi*.
- **rinka** — x_1 causes x_2; **no** agent place, because causes need not involve someone doing something (use **gasnu** / *lujvo* when you need an agent).
- **cinfo** — x_2 breed exists for **regularity** across animal/plant *gismu*, even when the species is not very diverse.

Ordering habits (not strict rules): places are often ordered by **salience** — e.g. **klama** puts the goer before the route. When both appear, **destination tends to come before origin**. "Under conditions" / "by standard" slots are often **last**.

ckaji (has / is characterized by) — important for **property** talk and adjacent to comparatives: x_1 is the entity, x_2 is the **property** (usually **le ka …**).

> **le gerku cu ckaji le ka xunre**
>
> *The dog has the property of being red.*

For machine-checkable place types and glosses, see the project's **typed *gismu* reference** (and the underlying `formal_gismu_.tsv` in the source tree).

Lujvo Place Structures

When you form a *lujvo*, you do not simply inherit the place structure of the *tanru* it came from. A *tanru* always carries the place structure of its right-hand word (the **tertau**), but a *lujvo* needs to take *all* of its components into account. This section explains how to think about which places a *lujvo* should have and in what order.

The seltau and tertau

In a two-part *tanru* — and therefore in a two-part *lujvo* — the left component is called the **seltau** (modifier) and the right component is called the **tertau** (head). The overall concept is a *type of* whatever the tertau describes, modified by the seltau.

For example, in **gerku zdani** (*dog house*), **zdani** is the tertau (it's a type of house) and **gerku** is the seltau (the dog part is the modifier). The resulting *lujvo* **gerzda** describes a kind of **zdani**, not a kind of **gerku**.

How a *lujvo* gets its meaning

A *tanru* is deliberately vague: **gerku zdani** just means "some house that has something to do with some dog." The *relationship* between the seltau and tertau is left open. A *lujvo*, by contrast, locks in one specific interpretation. The *lujvo*-maker picks the most useful and most obvious relationship.

Almost always, the best relationship is found by noticing that one place of the seltau refers to the *same thing* as one place of the tertau. For **gerzda**:

- **zdani**: z1 is a house for inhabitant z2
- **gerku**: g1 is a dog of breed g2

A dog living in a house means z2 (the inhabitant) is the same as g1 (the dog). That overlap is the relationship. Since they refer to the same thing, that place only needs to appear once in the *lujvo* — it is *merged*.

So the tentative place structure of **gerzda** becomes:

> *z1 is a house for dog z2=g1 of breed g2*

Dependent places

A place is **dependent** on another if you can predict its value once the other is known. For **gerku**, g2 (the breed) is dependent on g1 (the dog): once you know which specific dog you're talking about, the breed is determined. Dependent places that come from the *seltau* can often be dropped from the *lujvo*'s place structure.

So in **gerzda**, the breed place g2 gets dropped — you're describing a *doghouse*, not a *dog*, so the breed is incidental. The final place structure is simply:

> *z1 is a house for dog z2*

However, there's an important exception: **dependent places that come from the tertau are kept**. The tertau defines what kind of thing the *lujvo* is, and dropping its places would make the *lujvo* too different from the base word. If dropping a tertau place seems necessary, it's usually a sign that you've chosen the wrong tertau.

Sometimes a dependent place from the seltau is still important to keep. If you were making a *lujvo* for *school building* (**kuldi'u**, from **ckule dinju**), you'd want to keep the subject of the school even though it's technically dependent on the school identity, because *music school building* and *elementary school building* are very different.

Symmetrical and asymmetrical *lujvo*

When the overlap is between the *first place* of the seltau and the *first place* of the tertau — both components describing the same individual — the *lujvo* is called **symmetrical**.

Example: **balsoi** (*great soldier*), from **banli sonci**:

- **banli**: b1 is great in property b2 by standard b3
- **sonci**: s1 is a soldier of army s2

Here b1 = s1 (the same person is both great and a soldier). That's the symmetrical pattern.

When the first place of the seltau matches some *other* place of the tertau, the *lujvo* is **asymmetrical**.

Example: **gerzda** above — g1 (first place of **gerku**) matches z2 (second place of **zdani**), not z1. The *lujvo* is about the *house*, not the *dog*.

In principle, any asymmetrical *lujvo* could be made symmetrical by applying a SE conversion to one component. **gerzda** (asymmetrical) could be replaced by **gerselzda** (symmetrical: dog-housed-in), but that would make the first place the dog rather than the house, which is backwards for the meaning *doghouse*. Shorter and more direct is usually better.

Ordering the places

Once you've selected which places survive, you need to arrange them in a sensible order. The rules are:

For symmetrical *lujvo*: tertau places come first, then any surviving seltau places.

Example: **balsoi** place structure:

> *b1=s1 is a great soldier of army s2 in property b2 by standard b3*

The tertau (**sonci**) places come first: s2 (army). Then the surviving seltau (**banli**) places: b2 (property), b3 (standard).

For asymmetrical *lujvo*: the seltau places are inserted *immediately after* the tertau place they share. Remaining tertau places follow after.

Example: **dalmikce** (*veterinarian*, from **danlu mikce** — animal doctor):

- **danlu**: d1 is an animal of species d2
- **mikce**: m1 is a doctor to patient m2 for ailment m3 using treatment m4

Here d1 = m2 (the animal is the patient). Place structure:

> *m1 is a doctor for animal m2=d1 of species d2 for ailment m3 using treatment m4*

After the shared place m2=d1, the remaining seltau place d2 (species) is inserted, then the remaining tertau places m3 and m4.

Lujvo with more than two parts

Multi-part *lujvo* are easiest to understand as *nested binary tanru*. Treat the whole *lujvo* as having two components, where one or both of those components may themselves be *lujvo*.

Example: **bavlamdei** (*tomorrow*), from **ba** (future) + **lamji** (adjacent) + **djedi** (day). Think of it as **bavla'i** (next-after) + **djedi** (day), where **bavla'i** is itself an intermediate *lujvo*.

Build the place structure by composing the component place structures in the same way as for two-part *lujvo*, working from the inside out.

Eliding SE *rafsi* from the seltau

It is very common to drop the *rafsi* for SE conversion words (**se**, **te**, **ve**, **xe**) from the seltau of a *lujvo*, producing a shorter word. This is generally safe when the intended interpretation is clear and the alternative (without SE) would be implausible.

Example: **ti'ifla** (*bill, proposed law*), from **stidi flalu** (suggest + law). The second place of **stidi** (what is suggested) lines up with the first place of **flalu** (the law), but that means we'd normally need **selti'i** (suggested-thing) as the seltau. **ti'ifla** drops the **sel-** but still carries the same place structure as **selti'ifla** would have.

The convention is: give such *lujvo* the place structure they *would* have with the appropriate SE inserted. Just be aware that ambiguity is possible if another interpretation is equally plausible.

Eliding SE *rafsi* from the tertau — don't!

Dropping SE from the *tertau* is much more dangerous and should generally be avoided.

Consider translating *blue-eyed*. You might be tempted to use **blakanla** (from **blanu kanla**, blue + eye). But Jack is not an *eye* — he has eyes. The correct tertau is **selkanla** (bearer-of-eyes). Using the wrong tertau produces a *lujvo* whose first place is the eye, not the person with the eye, which means you'd always need **se blakanla** to get to the right referent. Instead, use **blaselkanla** with the SE made explicit.

Eliding KE and KEhE *rafsi*

Grouping *cmavo* **ke** and **ke'e** are often dropped from *lujvo* for brevity. This is usually fine when the correct grouping is obvious from context or plausibility.

Example: **zernerkla** (*to sneak in*) almost certainly comes from **zekri ke nenri klama** (crime-(inside-go)), since **zekri nenri** (crime-inside) makes little sense as a unit. The dropped **ke** doesn't cause confusion here.

However, be careful when the alternative grouping is also plausible — two different *lujvo* with different meanings can result from the same *rafsi* sequence depending on how the implicit grouping is read.

Note: if you want to apply a scalar negation (**na'e**, **to'e**) or SE conversion to an entire *lujvo*, it is safer to keep them as two words or use an explicit **ke** *rafsi* rather than just prepending the conversion *rafsi*.

Abstract *lujvo*

NU abstractors (**nu**, **ka**, **ni**, **du'u**, etc.) can participate in *lujvo* construction. When they do, all the places of the abstracted predicate become extra places of the *lujvo*, shifted down by one to leave room for the abstraction event place at position x_1.

Example: **nunkla** (from **nu klama**, event-of-going):

> *nu1 is the event of k1's going to k2 from k3 via k4 by means k5*

The **nu** place comes first (x_1 = the event), then all five places of **klama** follow as x_2–x_6.

For abstractors that have a second place (like **ni**, where x_2 is the measurement scale), that second place is placed *after* all the predicate places rather than before them.

The *rafsi* **jax-** corresponds to **jai**. When used in a *lujvo*, any **fai** place remains a **fai** place of the *lujvo* and does not participate in the numbered place structure.

Abstract *lujvo* are a common and productive pattern. English words ending in *-hood*, *-ness*, or *-dom* often map to **nun-** *lujvo* (from **nu**) or **kam-** *lujvo* (from **ka**): **kambla** = *blueness*.

Implicit-abstraction *lujvo*

A particularly important pattern arises when the seltau effectively serves as the *selbri* of an event abstraction that fills a place of the tertau — and that abstraction relationship is *not spelled out*, but is instead deducible from the semantics.

Example: **ctigau** (*to feed*), from **citka gasnu** (eat + agent-of). The place structure of **gasnu** requires its g2 place to be an event. If the seltau is **citka** (to eat), the listener can deduce that an event of eating is involved, even though the **nu** abstractor *rafsi* is absent. The final place structure is:

> *g1 (agent) causes c1 to eat c2*

This is equivalent to the more explicit but wordier **nunctikezgau**, but shorter and equally clear in context.

Other *gismu* with event places (**rinka**, **basti**, **galfi**, **jgina**, etc.) can form implicit-abstraction *lujvo* the same way. For example, **likygau** (*to liquefy*):

> *g1 causes l1 to be liquid of composition l2 under conditions l3*

Use implicit-abstraction *lujvo* when the implicit event is unambiguously recoverable. If the symmetrical interpretation (*both an agent and the thing being described*) is equally plausible, the implicit-abstraction reading can be confusing.

Anomalous *lujvo*

Some *lujvo* in common use don't perfectly follow the guidelines above — either because the seltau-tertau overlap is indirect, or because the veljvo doesn't fully capture the relationship. **lange'u** (*sheepdog*) is a classic example: a sheepdog is neither a sheep-breed dog nor a sheep that is a dog. Its real meaning is *dog that controls a sheep flock*, which requires a third component (**jitro**, to control) not present in the *rafsi* sequence. The shorter form **lange'u** is used as an abbreviation for the fuller but unwieldy **terlantroge'u**, and it inherits that longer *lujvo*'s place structure.

Anomalous *lujvo* are acceptable and common — just be aware that they require more interpretive effort from the listener and should ideally have their place structure clearly documented.

The Lujvo-Making Algorithm

Given a *tanru* to turn into a *lujvo*, the formal process is:

1. For every component *except the last*, choose a **3-letter or 4-letter rafsi**.
2. For the **last component**, choose a **3-letter (CVV or CCV) or 5-letter (long) rafsi**.
3. Join the *rafsi* into a single string.
4. Insert hyphen letters where required (see the rules in the previous section on *rafsi*). Work **right to left** when checking, since the *tosmabru test* (step 5) depends on what comes after.
5. **The tosmabru test:** if the *lujvo* begins with one or more CVC-form *rafsi* followed by another CVC-form *rafsi*, check that the sequence cannot be misread as a *cmavo* followed by a shorter *lujvo*. If it can, insert a **y-hyphen** or choose a different *rafsi*.

The algorithm was designed to be implementable by computer, and *lujvo*-making software can generate all valid forms automatically.

Choosing the best form: the scoring algorithm

When multiple valid *rafsi* combinations exist for the same *tanru*, the **lujvo scoring algorithm** selects the preferred dictionary form. The lowest-scoring form wins. Here's how the score is calculated:

Let **L** = total letter count (including hyphens and apostrophes), **A** = number of apostrophes, **H** = number of hyphen letters (y, r, n), and **R** = sum of *rafsi* type values (CVC/C *rafsi* score 2; CVC *rafsi* score 5; CVV-with-apostrophe score 6; CCV score 7; CVV-without-apostrophe score 8; long *rafsi* score lower). Let **V** = vowel count (excluding y).

Score = (1000 × L) − (500 × A) + (100 × H) − (10 × R) − V

In plain English, the algorithm strongly prefers **shorter words**, then penalizes apostrophes slightly less than full letters, then prefers fewer hyphens, then prefers "nicer" *rafsi* forms, and finally prefers more vowels as a tiebreaker.

Worked example (*tanru* **gerku zdani**, *doghouse*): using the *rafsi* choices for **gerku** and **zdani**, the scoring algorithm (described in the previous section) builds six hyphenated candidates. Their scores (lower = better dictionary form):

Candidate	Score
gerzda	5878
gerzdani	7917
ge'uzda	6367
ge'urzdani	9506
gerkyzda	8008
gerkyzdani	10047

gerzda wins — fewest letters, no hyphens. The formula is the same as in the previous paragraph; computers (and the **Scoring formula** section above) list every tie-break. You do not need to score by hand unless you are coining a **new** *lujvo* for a dictionary.

The Gismu Creation Algorithm

If you've ever wondered why Lojban's root words sound vaguely familiar in multiple languages, here's why. Each *gismu* was created by a systematic algorithm designed to maximize recognizability across the six most widely spoken languages at the time: **Chinese, English, Hindi, Spanish, Russian, and Arabic**.

The process:

1. Find a word in each of the six source languages for the concept. Render it into Lojban phonetics (simplify consonant clusters, drop endings, map vowels).
2. Try every possible 5-letter *gismu* shape (CVCCV or CCVCV). For each candidate, score how closely it matches the six source-language forms: 3+ matching letters in order = their count; exactly 2 matching consecutive letters = 2; otherwise 0.
3. Divide each match score by the length of the source word and multiply by a **language weight** (proportional to speaker population, with second-language speakers counted at half). Sum the weighted scores.
4. Eliminate any candidate that conflicts with an existing *gismu* (identical, or identical except for the final vowel — since those would share a 4-letter *rafsi*).
5. The highest-scoring remaining form becomes the *gismu*. Occasionally a slightly lower-scoring form is used to provide a more useful *rafsi*.

This is why **patfu** (*father*) sounds like *padre/paternal* to Romance language speakers, **nanmu** (*man*) echoes *nán* (Chinese) and *nam* (Hindi), and so on.

Cultural and non-algorithmic *gismu*

A small number of *gismu* were *not* created by the algorithm. They fall into a few groups:

- **Lojban-specific concepts**: words like **cmavo**, **lujvo**, **lojbo**, **mekso**, **gismu** itself — coined by combining or shortening other Lojban words. These are conceptually *lujvo*-like but are given *gismu* status (and *rafsi*) to keep *lujvo* built from them reasonably short.
- **Assignable predicates**: **broda**, **brode**, **brodi**, **brodo**, **brodu** — the five "pro-*brivla*" variables used for temporary *selbri* assignments (see Chapter 5).
- **International scientific vocabulary**: roots for chemical elements, SI units, and mathematical constants drawn from the international language of science.
- **Cultural gismu**: names for specific cultures, nations, or religions where the algorithm was inapplicable.

All non-algorithmic *gismu* end in **-o**, making them easy to recognize as exceptions.

Class	Shape	Role
cmavo	V, CV, VV, CVV (no consonant cluster)	Grammar particles
gismu	CVC/CV or CCVCV (5 letters)	Root predicates
lujvo	6+ letters, has consonant cluster	Compound predicates (from *rafsi*)
fu'ivla	Brivla-shaped loanwords	Borrowed concepts
cmene	Ends in consonant	Proper names

Also in this chapter: Recognizing words in a stream (boundary algorithm); **gerku zdani** scoring table (under **Choosing the best form: the scoring algorithm**).

Lujvo building steps:

1. Form a *tanru* expressing the concept
2. Find *rafsi* for each component
3. Chain *rafsi* left-to-right, inserting hyphen letters as needed
4. Verify: consonant cluster in first 5 non-y letters, ends in vowel
5. Optionally use **zei** for words without *rafsi*

Lujvo place structure:

- Default: start with tertau's places, add non-dependent seltau places
- Dependent places collapse (same entity as a tertau place)
- Symmetrical *lujvo*: both components equally present; asymmetrical: seltau narrows tertau

Comparatives:

- **zmadu** (exceeds) / **mleca** (less than) / **dunli** (equals) with **le ka** property
- BAI shortcuts: **mau** / **se mau** (from **zmadu**), **me'a** / **se me'a** (from **mleca**); **verai** (superlative among a set, from **traji** x_4); bare **rai** tags **traji** x_1 ("with superlative ...")

Chapter 15. Complex Selbri & Tanru

Tanru: Metaphorical Combination

A **tanru** is formed by placing two or more *brivla* together as the *selbri*. The first word (the **seltau**) modifies the second (the **tertau**), which carries the primary meaning.

mi sutra bajra

I quick-type run

→

I run quickly / I am a quick runner.

la .djan. barda nanla

John big boy

→

John is a big boy.

le zarci cu melbi zdani

The store is a beautiful home-type.

→ The store is like a beautiful home (in some way).

The relationship between seltau and tertau is always vague — "X-type-of Y" — and the exact meaning depends on context. This is intentional: *tanru* are a productive, poetic tool, like English compound nouns.

Possible readings of **klama jubme** (goer table):

- a table that goes (wheeled)
- a table owned by a traveler
- a table for people who travel
- a table associated with going in some way

Lojban does not force a single reading. The speaker chooses a *tanru* for its evocativeness; the listener infers from context.

Left-Grouping: The Default Rule

When three or more *brivla* appear in a *tanru* without explicit grouping, **left-grouping** applies: the leftmost two bind first.

ta cmalu nixli ckule = ta (cmalu nixli) ckule

That is a (small-girl)-type school.

The innermost *tanru* is **cmalu nixli** (small-girl), which then modifies **ckule** (school). So this is a school for small girls.

---

bo: Right-Grouping

bo causes the two *brivla* immediately surrounding it to bind more tightly than their neighbors. This creates right-grouping for those two words:

ta cmalu nixli bo ckule = ta cmalu (nixli ckule)

That is a small (girls'-school).

→ a small school for girls

vs.

ta cmalu bo nixli ckule = **ta (cmalu nixli) ckule** = left-grouping (same as default here)

That is a (small-girl)-type school.

Multiple bo also groups right-to-left:

ta cmalu bo nixli bo ckule = **ta cmalu (nixli (... ckule))**

The **bo** binds the last two it appears adjacent to. So **A bo B bo C** = **A (B-bo-C)**, not **(A-bo-B) C**.

---

ke ... ke'e: Explicit Parentheses

ke opens a grouping bracket and **ke'e** closes it (elidable at the end of a *selbri*). Everything inside is treated as a single *tanru* component:

ta ke melbi cmalu ke'e nixli ckule = **ta (melbi cmalu) nixli ckule**

That is a ((beautiful small) girl)-type school.

ta melbi ke cmalu nixli ke'e ckule = **ta melbi (cmalu nixli) ckule**

That is a beautiful (small-girl)-type school.

ke...ke'e is more readable than **bo** for complex groupings. It's like mathematical parentheses.

The five distinct groupings of **melbi cmalu nixli ckule** (*beautiful / small / girl / school*):

Lojban	Grouping	English gloss
melbi cmalu nixli ckule	((melbi cmalu) nixli) ckule	a school for girls who are beautifully small
melbi cmalu nixli bo ckule	(melbi cmalu) (nixli ckule)	a girls' school that is beautifully small
melbi ke cmalu nixli ke'e ckule	melbi (cmalu nixli) ckule	a school for small-girl-types that is beautiful
melbi cmalu bo nixli bo ckule	melbi (cmalu (nixli ckule))	a small school for girls that is beautiful
melbi ke cmalu nixli ckule ke'e	melbi ((cmalu nixli) ckule)	a beautiful school for small girls

Notes:

- **melbi cmalu** = "beautifully small" — the first combines with the second

- The **bo** rule is right-grouping: the *rightmost* pair groups first
- The final **ke'e** in the last form is elidable at end of *selbri*
- English "pretty little girls' school" has only 2 parseable groupings in speech (stress/tone); Lojban has 5 and can distinguish all of them in writing

For comparison, the three-word **cmalu nixli ckule** already has the CLL "little girls' school" ambiguity:

	Lojban	Grouping	Gloss	
	cmalu nixli ckule	(cmalu nixli) ckule	a school for small girls	
	cmalu nixli bo ckule	cmalu (nixli ckule)	a small girls'-school	

Adding **melbi** at the front multiplies the possibilities because **melbi** can bind with (cmalu), with (cmalu nixli), or can stand alone before the whole rest.

---

je: Logical Connection Within Tanru

When you want a thing to be *both* X *and* Y (not "X-type of Y"), use **je** between the two *brivla* in the seltau position:

> **barda je xunre gerku**
>
> *(big and red) type-of dog*
>
> → a dog that is both big and red

Without **je**:

> **barda xunre gerku** = (big-type-of-red) dog → a dog whose redness is big (weird!)

The **je** resolves the independence of two properties:

> **ta blanu je zdani**
>
> *That is blue and is a house.*
>
> (separately both, not "a blue-type house")

Other jeks work the same way inside *tanru*:

> **le bajra cu jinga ja te jinga**
>
> *The runner is a winner or a loser.*

> **xamgu jo tordu nuntavla**
>
> *(good iff short) speech*
>
> → speech that is good if and only if it is short

---

co: Tanru Inversion

Normally in a *tanru*, the *last brivla* is the head (the tertau). **co** inverts this: the word *after* **co** becomes the modifier, and the word *before* **co** becomes the head.

> **le gerku cu melbi** = The dog is beautiful. **le gerku cu melbi zdani** = The dog is a beautiful-type home. **le gerku cu zdani co melbi** = The dog is a beautiful-type home. (same meaning, inverted)

More practically, **co** lets the main predicate come first, with the modifier following:

> **mi tavla co lojbo**
>
> *I speak in a Lojban-type manner.*
>
> → I speak Lojbanically.

co has the widest scope of any *tanru* operator — it spans the whole *selbri*. Only one **co** can appear in a *selbri* at a time.

---

je'i, joi and Other Connectives in Selbri

joi in the seltau position creates a *mixed mass tanru* — the subject is "an inseparable mix" of two properties:

> **mi sofybakni joi xirma**
>
> *I am an inseparable-mix of (sofa-cow) and horse.*
>
> (exotic example)

In practice **joi** is more commonly used between *sumti* (see Chapter 8), but it's grammatically valid inside *selbri* too.

---

na'e and to'e in Tanru

The scalar negation particles **na'e** and **to'e** (from Chapter 13) bind directly to a single *brivla* within a *tanru*:

mi na'e sutra bajra

I (non-fast) run.

→ I run at a non-normal speed.

mi to'e sutra bajra

I slowly run.

le to'e melbi prenu

The ugly person.

They do *not* negate the whole *tanru* — just the *brivla* they precede.

Tense, NA, and negation: where to look

CLL threads **tense**, **bridi negation**, and **scalar negation** through the *selbri* in one long narrative. Friendly material **splits** by topic — use this map when you want "everything that can attach to a *selbri*":

Goal	Mechanism	Chapters
"This predication is false"	**na** before the *selbri* (or after **cu**)	13 — Negation
"Not that default value / opposite on the scale" on **one** *brivla*	**na'e** / **to'e** (this section)	13, **here**
Time / aspect / distance	**PU**, **ZI**, **FAhA**, **ZAhO**, …	9 — Tenses, 16 — Advanced tenses
Modal tags (**because**, **with tool**, …)	**BAI**, **fi'o**	10 — Modals

na (false) and **na'e** (non-) are different devices; tenses attach to **selbri** or **bridi** in stacks — order can matter. See Chapter 13 for **na** vs **nai** vs **jo'ai**, and Chapter 9 for tense–modal ordering.

Place Structures of Tanru

A *tanru*'s place structure is always that of its **tertau** (the final/main *brivla*). The seltau's places are irrelevant to the *bridi*:

mi sutra klama le zarci

I quickly go to the store.

Here **sutra** modifies **klama**, but the *sumti* slots are those of **klama** (x_1=goer, x_2=destination, etc.). The "speed" implied by **sutra** is inferred, not a numbered slot.

This is why *tanru* are semantically vague but grammatically clean: only the tertau's place structure is imposed.

JAI: Converting Tags into Selbri

jai is a special operator that converts a **tense or modal tag** into a *selbri* component, and simultaneously shifts the x_1 place.

Without **jai**, a modal tag like **mu'i** (because of / with motive) can only appear as a free prefix before the *selbri*:

> **mu'i le nu mi djica cu klama**
>
> *[With motive: my wanting] I go.*
>
> (mu'i = motivated-by tag)

With **jai**, the tag *becomes* part of the *selbri*, and x_1 of the new *selbri* is the *referent* of the tag's value:

> **le nu mi djica cu jai mu'i klama**
>
> *My wanting is the motive for the going.*
>
> (x_1 = le nu mi djica, filling the mu'i slot)

The most common use is with **fai** — the special place created by **jai** for the original x_1:

> **le nu mi djica cu jai mu'i klama fai mi**
>
> *My wanting is what motivates the going, which is done by me.*
>
> (fai mi = the original x_1 "I" is pushed to fai)

jai with FA tags: when combined with a plain FA tag (like **tu'a**), jai converts the *sumti* into an appropriate *selbri*:

> **le gerku cu jai gau klama** = The dog is the agent of going. (jai gau = agentive)

Practical common use — jai gau:

gau (the agent-of BAI *cmavo*) combined with **jai** is a clean way to express "causes X to happen":

> **mi jai gau cadzu le nanmu**
>
> *I cause the man to walk.*

(literally: I am the gau-agent of the man's walking)

This is more precise than using a causative *tanru*, because **jai gau** explicitly invokes the BAI causal role.

Why ke/ke'e Exists: The Grammar Perspective

You already know that **ke...ke'e** creates parenthetical grouping in *tanru*. But *why* is this a dedicated *cmavo* pair, rather than just how juxtaposition works?

The formal grammar defines *tanru* as a sequence of *selbri* components with **left-grouping as the default**. This means the grammar can't interpret "extra" juxtaposition as "tighter binding" without ambiguity. There is no way for the parser to know, from word order alone, that three *brivla* **A B C** should group as **A (B C)** rather than **(A B) C**.

bo resolves this for a *pair* — it marks the two words around it as a tightly-bound unit. But **bo** can only group two things at a time, and nesting **bo bo bo...** quickly becomes unreadable.

ke solves the general case: it acts as an opening parenthesis in the grammar, and **ke'e** is the explicit closing parenthesis. This gives the parser a clear left-bracket at an arbitrary point in the *tanru* sequence:

```
le melbi ke cmalu nixli ke'e ckule
       [        opens here        ]
= melbi [(cmalu nixli)] ckule
```

The grammar rule is: after seeing **ke**, the parser begins collecting a *sub-selbri* until it sees **ke'e** (or until the *selbri* ends, at which point an elided **ke'e** is assumed).

ke'e is almost always elidable at the end of the *tanru*, because the end of the *selbri* naturally closes it — but it is *required* when the grouping ends mid-*tanru* and another component follows. Compare:

le melbi ke cmalu nixli ke'e ckule — ke'e required (more components follow) **le ckule ke cmalu nixli** — ke'e elidable (

tanru

ends here)

The same **ke/ke'e** pair also works with *connectives* — connecting whole phrases inside a *tanru* bracket:

le ke cmalu ja barda ke'e nixli

The (small or large) girl

(ja = or, connecting the two modifiers as a unit)

Without **ke**, the **ja** would only connect the two words on either side of it. With **ke**, it spans the whole grouped phrase.

---

me: Turning Sumti into Selbri

Any *sumti* can be converted into a *selbri* using **me**:

> **le gerku cu me la fido.**
>
> *The dog is Fido-type.*
>
> = The dog is like Fido / is Fido.

me creates a *selbri* meaning "is [the thing described by *sumti*]". It's used to:

- Make a *sumti* into a type: **mi me la .lojban.** = *I am a Lojban-type person*
- Borrowed or long names: **le zgike cu me la'o gy. Beethoven gy.** = *the music is Beethoven-type* (style associated with that name)

Close the **me** phrase with **me'u** (elidable at end of *selbri*):

> **le me la .alis. me'u cu melbi**
>
> *The Alice-type thing is beautiful.*

me is particularly useful with *cmavo* that normally aren't *selbri*:

> **le se cusku be mi cu me zo blanu**
>
> *What I said was the-word-"blanu"-type.*
>
> = I said the word "blanu".

Other Kinds of Simple Selbri

Besides *brivla* and *tanru*, several constructions yield a *selbri*:

Number words as *selbri*:

> **mi ci** — I am three / I am the third **le ci prenu** — the three people (ci quantifies prenu)

Numbers and other PA *cmavo* can serve as predicates of quantity or ordinal:

> **le vo prenu cu xabju ti** — The four people live here.

moi (ordinal) and other MOI *cmavo*:

mi pamoi — I am first. **do remoi** — You are second.

cmavo	Meaning	Example
moi	ordinal (N-th)	**pamoi** = first
mei	group of N	**relmei** = a pair
si'e	fraction N/N	**piso'imei** = most of a group
cu'o	probability	**ci cu'o** = three-in-ten chance
ka'a	this many times	**rekai** = twice

le nanmu pu klama le cimoi dinju

The man went to the third building.

(**cimoi** = **ci** + **moi**, third; not **romoi**, which would be **ro** + **moi**)

Tanru Taxonomy: Patterns of Meaning

Tanru meaning is deliberately vague — the exact relationship between seltau and tertau is left for context to determine. But in practice, *tanru* tend to fall into recognizable patterns. Knowing these patterns helps you both interpret and construct *tanru* naturally.

Asymmetrical Tanru

In *asymmetrical tanru*, word order matters: **clock pendulum** is the type of pendulum used in clocks, while **pendulum clock** is the type of clock that uses a pendulum. Most *tanru* are asymmetrical.

Seltau = object of the tertau's action

The seltau names what the tertau-action is applied to or directed at:

Tanru	Gloss	Meaning
pinsi nunkilca'a	pencil sharpener	sharpener used on pencils
finpe nunkalte	fish hunting	fishing
smacu terkavbu	mouse trap	trap set for mice
zerle'a nunte'a	thief fear	fear of thieves

Seltau = element type, tertau = the set

The seltau describes what the members of the tertau group are:

Tanru	Gloss	Meaning
zdani lijgri	house row	a row of houses
tadni girzu	student group	a group of students
rokci derxi	stone heap	a heap of stones

Seltau = whole object, tertau = a part of it

The seltau names the whole; the tertau is a component or detail of that whole:

Tanru	Gloss	Meaning
junla dadysli	clock pendulum	the pendulum of a clock
zdani vorme	house door	the door of a house

Seltau = purpose or goal

The seltau describes what the tertau is for or aimed at:

Tanru	Gloss	Meaning
cukta kumfa	book room	a room for books
bilni traji	military excellence	excellence in military things

Seltau = material

The seltau names the substance the tertau is made of:

Tanru	Gloss	Meaning
rokci zdani	stone house	a house made of stone
solji djine	gold ring	a ring made of gold
mudri xarci	wooden weapon	a weapon made of wood

Seltau = resemblance

The tertau resembles the seltau in some relevant way:

Tanru	Gloss	Meaning
gerku bacru	dog utterance	a bark (sounds like a dog)
mlatu tuple	cat foot	a paw (resembles a cat's foot)

Seltau = location or time context

The seltau specifies where or when the tertau's referent belongs:

Tanru	Gloss	Meaning
cevni zekri	god crime	crime against the gods
tcadu prenu	city person	a city dweller

Symmetrical Tanru

In *symmetrical tanru*, order does not significantly affect meaning — either word could come first. These often correspond to logical conjunction with **je**.

Things that are correctly described by both components

These are *tanru* where the referent genuinely fits both the seltau and the tertau. They could be rephrased with **je** (and):

Tanru	Gloss	Meaning
remna nakni	human male	a man
remna fetsi	human female	a woman
panzi nanmu	offspring man	son
nolraitru prije	royal sage	a wise king
sonci tolvri	soldier coward	a cowardly soldier

Note that **remna nakni** means essentially the same as **nakni remna** — both describe something that is both human and male. This symmetry distinguishes these from cases where order matters.

Using These Patterns

When you form a *tanru*, you are picking the pattern implicitly. When someone hears your *tanru*, they use pragmatics — the surrounding context — to decide which pattern fits best. This is by design: Lojban *tanru* are *deliberately ambiguous*. If you need precision, either:

1. **Explain in context** — let the surrounding *bridi* make the meaning clear
2. **Convert to lujvo** — a compound word with a fixed, agreed meaning
3. **Use explicit connectives** — **je** for "both", non-logical connectives for mixtures, etc.

The *tanru* system lets you coin new combinations freely. The cost is vagueness; the benefit is expressiveness and flexibility.

Summary

Tool	Function
[A B] (juxtaposition)	*tanru*: A modifies B (left-groups by default)
bo	right-groups: A bo B = tighter than neighbors
ke ... ke'e	explicit parentheses (grammar brackets for sub-*selbri*)
je (jek in seltau)	logical AND between seltau components
co	inversion: X co Y = Y-type X
na'e, to'e	scalar negation of one *brivla*
jai + tag	converts modal/BAI tag into a *selbri*; promotes tag's argument to x_1
jai gau	"causes X to happen" — agentive construction
fai	the displaced original x_1 when jai is used
me + *sumti*	converts any *sumti* into a *selbri* ("is [*sumti*]-type")
moi/mei/si'e	MOI *cmavo*: ordinal, group, fraction *selbri*

Tense / negation map: na vs **na'e**/**to'e** vs tense *cmavo* — see **Tense, NA, and negation: where to look** above.

Rules:

- Default *tanru* is left-grouping: A B C = (A B) C
- **bo** = right-group its two neighbors: A B bo C = A (B C)
- **ke...ke'e** = explicit grammar brackets; **ke'e** required when grouping ends mid-*tanru*
- **je** = both properties hold independently (not "A-type-of B")
- **co** = wide-scope inversion, one per *selbri*
- **jai** = tag-to-*selbri* conversion; the tag's value becomes x_1
- Tanru inherits *tertau*'s place structure
- **me** = *sumti* ⟶ *selbri* (the *sumti* becomes a type)

Tanru taxonomy (patterns of meaning):

- Tanru meaning is deliberately vague; context determines the relationship
- *Asymmetrical tanru*: order matters; common patterns include seltau as object of action, material, location, purpose, resemblance, etc.
- *Symmetrical tanru*: order doesn't affect core meaning; often equivalent to **je** (logical AND): **remna nakni** = human male = **remna je nakni**
- If precision is needed: explain in context, convert to *lujvo*, or use explicit connectives

Summary

Chapter 16. Advanced Connectives & Tenses

Forethought Connectives: geks and guheks

Chapter 8 introduced the basic connective forms. This chapter covers the complete system and edge cases.

Forethought *bridi* connectives (geks) signal the connection *before* either *bridi*. The separator **gi** appears between them:

Gek	Meaning	Form
ga ... gi	either ... or	(A)
ge ... gi	both ... and	(E)
go ... gi	... iff ...	(O)
gu ... gi	... whether or not	(U)
ganai ... gi	if ... then	(A+nai)
genai ... gi	not-both	(E+nai)

> **ge la .alis. cu klama gi la .djan. cu cadzu**
>
> *Both Alice comes and John walks.*

> **ganai mi klama gi do klama**
>
> *If I go, then you go.*

Note the order: with **ganai...gi**, the *first bridi* is the antecedent (the "if" part).

Forethought *selbri* connectives (guheks) work inside *selbri*:

> **gu'e blanu gi xunre gerku**
>
> *a both-blue-and-red dog*

Termsets: Connecting Parallel Sumti

When two *bridi* differ in *multiple sumti* simultaneously, you can use a **termset** to connect them all in parallel. The termset brackets are **nu'i ... nu'u** (start/end):

nu'i ge mi gi do nu'u klama

Both I and you go.

(simplified: **mi .e do cu klama**)

More complex termsets arise when multiple slots change together:

nu'i mu'igi la .djan. lei jdini mi gi la .alis. le cukta do nu'u
Connecting: John gave me money ←→ Alice gave you the book (by motivation)

Termsets ensure the logical connection applies to all the listed *sumti* simultaneously rather than distributing one *sumti* at a time. This is discussed in detail when dealing with modal connections (Chapter 10).

---

giheks: Bridi-Tail Connectives

A **gihek** connects two *bridi-tails* — the *selbri* plus following *sumti*, sharing the same x_1:

mi citka gi'e pinxe

I eat and drink.

(mi = shared x_1)

mi citka gi'a pinxe

I eat or drink.

mi klama le zarci gi'enai cadzu

I go to the store, but not walking.

(I go but don't walk there)

Giheks are the most natural connective form when the subject is shared — they're much more concise than full **.ije** connectives.

Gihek forms:

Particle	Operation
gi'e	and
gi'a	or
gi'o	iff
gi'u	whether or not
gi'enai	but not (A and-not B)
nagi'e	not-A and B

Tense and Aspect: The Full ZAhO System

Chapter 9 covered the basic ZAhO aspect particles. Here's the complete system with their precise meanings:

An event has an internal structure: pre-start phase → start → middle → end → post-end phase.

Particle	Phase	Meaning
pu'o	anticipatory (pre-start)	is about to [start doing]
co'a	initiating (start)	begins to
ca'o	continuitive (middle)	is in the middle of
co'u	cessitive (end)	stops/ceases
mo'u	completive (reaches natural end)	finishes
za'o	superfective (past natural end)	continues past when it should have stopped
co'i	achievative (whole event as point)	completes / the event as a whole
ba'o	resultative (post-end state)	is in the state following completion

mi pu'o klama —

I am about to go.

mi co'a klama —

I start going.

mi ca'o klama —

I am in the process of going.

mi co'u klama —

I stop going.

mi mo'u klama —

I finish going (reached the destination).

mi za'o klama —

I keep going (past when I should have stopped).

mi ba'o klama —

I have gone (am in the resultant state).

mi co'i klama —

I went (the event of going, viewed as a whole point).

Combining tense and aspect:

Tense (pu/ca/ba) comes before aspect:

mi pu co'a klama —

I started going [in the past].

mi ba mo'u citka —

I will finish eating [in the future].

mi ca za'o tavla —

I am still talking [now].

(past the appropriate time)

Tense Intervals: Anchoring

The interval particle (ze'i/ze'a/ze'u) can be further anchored with a following direction:

mi ca ze'ica cusku dei

I [now] [short-interval-centered-on-now] say this.

→ I am now saying this sentence.

> **mi pu ze'iba klama**
>
> *A short time ago, I went [and the going extended forward toward now].*

When Tenses Stack

Multiple tense elements in sequence describe a compound imaginary journey:

> **mi pu ba klama**
>
> *I [past-then-future] go*
>
> → At some past moment, I was going to go.

> **le nanmu puzu vu batci le gerku**
>
> *Long ago and far away, the man bit the dog.*

Each tense element adds a leg of the journey: **pu** (go back in time), **zu** (long distance in that direction), **vu** (long distance in space).

Connected Tenses in Discourse

Tense can be *set* for a whole passage using **ki**, the tense bookmark:

> **puki mi klama le zarci .i le zarci cu barda**
>
> *[Setting: past.] I go to the store. The store is big.*
>
> (both sentences understood as past)

ki attaches to a tense, making it a *reference point* that persists:

> **puki** — set "past" as current reference **caki** — set "present" as current reference **baki** — set "future" as current reference

Any subsequent *bridi* without an explicit tense is interpreted relative to the **ki**-set reference. Reset with **caki** to return to speaker-now.

na'o and ta'e: Habitual and Iterative

Two special tense-like particles express habituality and custom:

na'o — typically/usually (in the relevant context, events of this type usually occur)

> **mi na'o citka lo plise**
>
> *I typically eat apples.*
>
> (not every time, but usually)

ta'e — habitually (as a regular habit of the x_1)

> **mi ta'e klama le zarci**
>
> *I habitually go to the store.*
>
> (it's what I do)

ru'i — continuously (without break)

> **mi ru'i cadzu**
>
> *I walk continuously (without stopping).*

These combine with the ordinary PU tenses:

> **mi pu ta'e klama le zarci**
>
> *I used to habitually go to the store.*

All 16 Truth Functions

A logical connective is fully described by its **truth table** — what happens in each of the four cases (T+T, T+F, F+T, F+F). With four slots, each can be true or false independently, giving 16 possible functions.

Lojban encodes all 16 using the vowel (A/E/I/O/U) plus optional **na** (negate first) and **nai** (negate second). The core four vowels:

Vowel	Function	TTFF truth pattern	Plain English
A	inclusive or	TTTF	at least one is true
E	and	TFFF	both are true
O	iff	TFFT	same truth value
U	whether or not	TTFF	first, regardless of second

The others are derived by negating one or both inputs:

Full form	Vowel base	negate first?	negate second?	English
A	or	—	—	A or B
E	and	—	—	A and B
O	iff	—	—	A iff B
U	A regardless	—	—	A (ignores B)
naiA	A (nai B)	—	yes	A or not B
naiE	not-both	—	yes	not (A and B)
naiO	exclusive or	—	yes	A xor B
naiU	B regardless	—	yes	B (ignores A)
naA	not-A or B	yes	—	if A then B
naE	not-A and B	yes	—	not-A and B
naO	xor	yes	—	same as naiO
naU	not-A	yes	—	not A (ignores B)
nainaiA	not-or = nor	yes	yes	neither A nor B
nainaiE	nand	yes	yes	not (A and B)
nainaiO	biconditional	yes	yes	same as O
nainaiU	neither	yes	yes	not B

In practice, the most used are **A** (or), **E** (and), **O** (iff), and **naA** (if-then). The others arise in careful logical writing.

How nonstandard truth functions are spelled: The same **na** / **nai** recipe applies everywhere — **ijek**, **jek**, **ek**, **gek**, etc. **na** before the connective core negates the **first** piece; **nai** after the vowel negates the **second**. So **.inaja** = if-then; **.ijanai** = A or not-B; **.inaje** = not-A and B; **.jenai** = A and-not-B. The tables above name the 16 functions; the morphology is uniform once you know the base vowel (**A/E/O/U**).

Tenses and Logical Connectives

Chapter 8 gives bare **.ije** / **gi'e**; this section is about **where tense and modals sit** when they scope the *connection* itself.

Two *bridi*, sequential: put the tense (or modal) **between** the connective and **bo** (or **tu'e**):

> **mi viska pa nanmu .ije babo mi viska pa ninmu**
>
> *I see a man, and [later] I see a woman.*

Here **ba** between **.ije** and **bo** says the second *bridi* is **after** the first (relative time), while **pu** on each *bridi* can still anchor both to the speaker's past if you add it.

Forethought with one tense on the whole compound: a tense before **ge … gi** can apply to **both** tails at once:

> **mi pu ge klama le zarci gi tervecnu lo cidja**
>
> *I, in the past, both went to the market and bought food.*
>
> (both events past; order between them not specified)

That differs from **.ije babo**, which asserts an explicit **later-than** relation between the two.

Modals + connectives: mixed **BAI** + **.ije** (e.g. **.ijeki'ubo**) — Chapter 10. Full CLL-style rules (ek + **bo**, gihek + **bo**, mekso parallels) are in CLL Ch.14 § "Tenses, modals, and logical connection".

Summary

Forethought connectives:

- **ge…gi** (both), **ga…gi** (or), **go…gi** (iff), **ganai…gi** (if-then)
- Add forethought guheks inside *selbri*: **gu'e…gi**

Giheks (*bridi*-tail connectives, shared x_1):

- **gi'e** (and), **gi'a** (or), **gi'o** (iff), **gi'enai** (but not)

Full ZAhO aspect system:

- **pu'o** (about to), **co'a** (starts), **ca'o** (ongoing), **co'u** (stops), **mo'u** (completes), **za'o** (goes on too long), **ba'o** (resultant state), **co'i** (whole event)

Habitual/iterative:

- **na'o** (typically), **ta'e** (habitually), **ru'i** (continuously)

Tense bookmark:

- **puki / caki / baki** — sets reference point for subsequent *bridi*

Termsets (nu'i … nu'u):

- Connect multiple *sumti* in parallel across two *bridi*
- Ensure logical connective applies to all listed *sumti* simultaneously

All 16 truth functions:

- Built from 4 vowels (A/E/O/U) + optional **na** (negate first) and **nai** (negate second)

Summary

- Most useful: **A** (or), **E** (and), **O** (iff), **naA** (if-then = A implies B)

Tense + connective stacking:

- **.ije babo** — tense (e.g. **ba**) between **.ije** and **bo** relates the two *bridi* in time
- **pu ge … gi** — one leading tense can apply to both forethought-connected *bridi*
- Plain **.ije** with a tense on each *bridi* — often the clearest
- **Mixed modal + .ije** — Ch.10 **.ijeki'ubo** etc.

Nonstandard truth functions:

- Build with **na** / **nai** on the same vowel skeleton as Ch.8 — see **How nonstandard truth functions are spelled** above

Chapter 17. Text Structure & Quotation

Sentence Separators: .i

In written and spoken Lojban, sentences are separated by **.i** (a pause + the vowel i). Unlike an English period, **.i** appears *between* sentences — not after the last one:

> **mi klama le zarci .i do cadzu le bisli**
>
> *I go to the store. You walk on the ice.*

.i implies the sentences are on the same topic or in sequence. The relationship is left vague unless you add a connective directly after **.i**:

> **mi klama le zarci .ije do cadzu** —
>
> *I go to the store, and you walk.*
>
> **mi klama le zarci .ini'ibo do cadzu** —
>
> *I go to the store; therefore you walk.*

.ibo after **.i** signals the next sentence is more tightly grouped with the previous one than normal.

Paragraphs: ni'o and no'i

/ **ni'o** — new topic / paragraph break:

Signals a topic change. Multiple **ni'o** *cmavo* in a row indicate a larger-scale shift.

/ **no'i** — resume previous topic:

Like "getting back to the point…" in English. Resumes the topic in effect before the last **ni'o**.

> **ni'o la .teris. cu klama le barda tcadu**
>
> *(New topic:) Terry goes to the big city.*

In writing: one **ni'o** = minor topic shift; **ni'oni'o** = major shift (also cancels assigned pronouns); **ni'oni'oni'o** = drastic reset (also resets tenses and indicators).

da'o explicitly cancels all current pronoun assignments (**ko'a**, **ko'e**, etc.) without changing the topic.

Topic-Comment Sentences: zo'u

zo'u separates a *topic* (a *sumti*) from a *comment* (a *bridi*). This is like Chinese topic-comment structure:

> **le nuzba zo'u mi ba'o djuno**
>
> *The news: I already know.*
>
> → I already know the news.

> **le finpe zo'u citka**
>
> *The fish: eat*
>
> (ambiguous — is the fish eating, or being eaten? Left vague)

zo'u is also used to introduce quantifier prenexes in logic (see Chapter 16):

> **ro da poi prenu zo'u da morsi**
>
> *For all X that are persons: X dies.*
>
> → All people die.

Quotation

Lojban has several distinct quotation types, each with different properties:

---

lu ... li'u — Direct Quotation of Lojban Text

lu opens a quotation of grammatical Lojban; **li'u** closes it. The contents are treated as a *sumti* (the quoted text itself):

> **la .alis. cusku lu mi klama le zarci li'u**
>
> *Alice says "I go to the store."*

The pronouns inside **lu…li'u** refer to the *speaker of the quotation*, not the outer speaker. So **mi** inside quotes refers to Alice.

li'u is elidable at the end of a *bridi* but usually kept for clarity.

---

lo'u … le'u — Error/Out-of-Context Quotation

When quoting something that may not be grammatical or that you want to mark as questionable:

> **lo'u mi pu le'u cu se cusku la .djan.**
>
> *"mi pu" [fragment] was said by John.*

---

zo — Single-Word Quotation

zo quotes the *next single word* as a word (not its meaning):

> **zo klama cu gismu**
>
> *"klama" is a gismu.*

> **zo coi cu cmavo**
>
> *"coi" is a cmavo.*

zo works for any single Lojban word, including *cmavo*. It cannot quote multiple words — use **lu…li'u** for that.

---

zoi — Foreign-Language Quotation

zoi quotes text from another language (or any arbitrary string). The syntax uses a delimiter word that appears on both sides and must not appear in the quoted text:

> **zoi gy. Hello World .gy.**
>
> *"Hello World" (in English)*

> **mi cusku zoi gy. I love Lojban .gy.**
>
> *I say "I love Lojban."*

The delimiter (here **gy.**) can be any Lojban word that doesn't appear in the text being quoted. **gy.** (the letter G) is conventional for English text.

---

la'o — Foreign Name as Sumti

la'o uses the same delimiter mechanism as **zoi** but creates a *name sumti* from a foreign word:

> **la'o gy. Aristotle .gy. cu se cusku ro nimcli**
>
> *Aristotle is quoted by every philosopher.*

This is the correct way to use actual foreign proper names in Lojban without Lojbanizing them.

---

me and me'u: Sumti-to-Selbri Conversion

me turns any *sumti* into a *selbri* meaning "is a member of the set described by [*sumti*]":

> **ta me le'o**
>
> *That is a lion-like thing.*
>
> (me le'o = is of the type described by le'o)

> **le karce cu me lo bloti**
>
> *The car is a boat-type thing.*
>
> (it functions like a boat)

me'u terminates the **me** construction (elidable at end of *selbri*).

This lets you use descriptions, names, and other *sumti* as predicate words, bridging the divide between *sumti* and *selbri*.

---

pe'a: Metaphorical Use Marker

pe'a marks a word as being used *metaphorically* rather than literally:

> **mi pe'a klama le skami**
>
> *I metaphorically go to the computer.*
>
> → I log in / I access the computer.

It signals "I know this isn't literally true — take it as a metaphor or extension."

ji'a (also) and **si'a** (similarly) are related discourse markers:

ji'a — in addition, also (additive)

> **mi klama .i ji'a do klama**
>
> *I go. Also, you go.*

si'a — similarly

> **mi klama .i si'a do**
>
> *I go. Similarly, you [go].*

LAhE: Sumti Qualifiers

LAhE *cmavo* wrap a *sumti* and change *what it refers to* — they shift reference between a thing, its symbol, and its containing set or mass.

cmavo	Meaning	English gloss
la'e	the referent of [*sumti*]	what [*sumti*] refers to
lu'e	the symbol/name for [*sumti*]	a word/sign for [*sumti*]
tu'a	something about/involving [*sumti*]	a vague event/situation re [*sumti*]
lu'a	an individual member of [*sumti*]	a member of the set/mass
lu'i	the set containing [*sumti*]	the set of [*sumti*]
lu'o	the mass of [*sumti*]	[*sumti*] treated as a single mass
vu'i	the sequence of [*sumti*]	[*sumti*] in sequence

la'e and **lu'e** are reverse operations — one goes from symbol to referent, the other from referent to symbol:

> **zo .bab. cmene la'e zo .bab.**
>
> *The word "Bob" is the name of the referent of "Bob".*

(the actual person Bob)

lu'e la .bab. cmene la .bab.

A symbol for Bob is the name of Bob.

tu'a is practically very common — it lets you say "I want something to do with X" without specifying exactly what:

mi djica tu'a le plise

I want something involving the apple.

(I want to eat it / have it / something)

mi djica tu'a do

I desire something involving you.

(deliberately vague about what exactly)

Without **tu'a**, you'd need a full abstraction: **mi djica le nu mi citka le plise**. With **tu'a** you can stay economical.

lu'a, **lu'i**, **lu'o**, **vu'i** convert between different ways of grouping referents:

mi tavla lu'a le gunma

I talked to a member of the group.

(not the whole group)

mi viska lu'i le'i prenu

I see the set of people.

(as a mathematical set, not just the people)

lu'o mi'a klama

We (as a mass) go.

(the mass acts together)

All LAhE *cmavo* terminate with **lu'u** (elidable in most contexts):

> **mi nelci la'e lu'u le cukta = mi nelci la'e le cukta**

BAhE: Emphasis and Nonce Words

ba'e stresses the *next word*, like spoken emphasis or written italics. It marks that the following word is the most important part of what's being said:

> **mi viska ba'e la .djonz.**
>
> *I saw* Jones.
>
> (not someone else)

> **ba'e mi viska la .djonz.**
>
> I *saw Jones.*
>
> (not someone else)

> **mi ba'e viska la .djonz.**
>
> *I* saw *Jones.*
>
> (as opposed to hearing about him)

za'e marks the next word as a *nonce coinage* — an on-the-spot, ad-hoc word the speaker is inventing for local use, which may not exist in the dictionary:

> **mi klama la za'e .albeinias.**
>
> *I go to so-called "Albania".*
>
> (nonce Lojbanization of a foreign name)

> **le za'e smacu'i cu zvati le zdani**
>
> *The so-called "mouse-neutral-thing" is in the house.*
>
> (speaker is coining **smacu'i** on the spot)

za'e is a courtesy to the listener — it says "I know this isn't a standard word, I'm making it up as I go."

MAI: Utterance Ordinals

mai and **mo'o** turn numbers into ordinal free modifiers — *firstly, secondly, lastly*, etc. They can appear anywhere in an utterance:

> **pamai mi klama le zarci**
>
> *Firstly, I go to the store.*

> **remai mi viska le mlatu**
>
> *Secondly, I see the cat.*

> **romai mi sipna**
>
> *Lastly / finally, I sleep.*
>
> (**ro** = all/every → "all-thly" = lastly)

Any number can precede **mai**: **cimai** = thirdly, **vomai** = fourthly, etc.

mo'o works the same way but marks higher-level sections (chapters, major divisions) rather than list items:

> **pamo'o** = Section 1 / Chapter 1 **remo'o** = Section 2

You can combine them: **pamo'o pamai** = Chapter 1, point 1.

FUhE / FUhO: Attitudinal Scope

Normally an attitudinal applies to *one word* — the word immediately before it (or the whole utterance if at the start). But **fu'e** and **fu'o** let you explicitly control scope over a longer span:

fu'e opens an *attitudinal scope* — the attitudinal applies to everything until **fu'o** closes it:

> **mi viska le fu'e .ia blanu zdani fu'o ponse**
>
> *I see the owner of what-I-believe-to-be a blue house.*

Here **.ia** (belief) applies to **blanu zdani** (blue house) but *not* to **ponse** (owner), because **fu'o** closes the scope before **ponse**.

Without **fu'e/fu'o**, **.ia** would attach to whatever single word it follows. This is usually sufficient, but for complex descriptions spanning many words, the scope markers give you precise control.

fu'e with an attitudinal at sentence start applies that attitudinal to all following sentences until **fu'o**:

> **fu'e .ui mi klama le zarci .i mi facki lo cukta fu'o**
>
> *[Happiness scope:] I go to the store. I find a book. [End happiness scope.]*

Parentheticals: to/toi, to'i, and sei/se'u

These three constructs all insert material that is "outside" the main claim — but they work very differently.

to ... toi — Spoken Parentheses

to opens a parenthetical aside; **toi** closes it. The content inside can be *any text* and is structurally invisible to the outer parse:

> **mi klama to la .djan. pu cusku ke'u toi le zarci**
>
> *I go (John had said this before) to the store.*

> **mi to .ui toi klama le zarci**
>
> *I (yay!) go to the store.*
>
> (the .ui is parenthesized for emphasis)

to'i marks an *editorial or quoted* parenthetical — the content was not said by the current speaker (it's someone else's words or an inserted comment):

> **mi prami do to'i se cusku la .djan. toi**
>
> *"I love you" (said John, according to the text).*

sei ... se'u — Metalinguistic Commentary

sei opens a sub-*bridi* that comments on the *discourse itself* — on the act of speaking, not on external facts. The sub-*bridi* inside **sei** is a full grammatical *bridi* but does not affect the truth conditions of the outer sentence:

> **mi citka sei mi cusku se'u vau le plise**
>
> *I eat (I say again) the apple.*

> **le se'i bridi** conventionally fills x_2 of the **sei**-

> *bridi*
>
> 's
>
> *selbri*
>
> — the sentence being commented on.

Why sei/se'u exists (grammar perspective): The parser needs a way to embed a *bridi inside a bridi* without the inner *bridi*'s *sumti* being confused with the outer *bridi*'s *sumti*. **sei** acts as a bracket that says "parse this as a free modifier sub-*bridi*, not as a continuation of the main clause." **se'u** closes it explicitly; it can be elided before **.i** or **vau**.

Common uses:

> **sei mi jinvi** = in my view / according to my opinion (sei-
>
> *bridi*
>
> = "I opine") **sei se cusku** = as is said / as stated (standard formula)

Comparing the three:

	Construct	Content type	Grammatical role	Truth condition effect	
	to…toi	any text	opaque / invisible	none	
	to'i…toi	editorial insertion	opaque	none	
	sei…se'u	grammatical *bridi*	free modifier sub-*bridi*	none (metalinguistic)	

SI / SA / SU: Metalinguistic Erasers

These *cmavo* are used in *spoken Lojban* (and informal writing) to correct mistakes on the fly:

cmavo	Erases
si	the immediately preceding word
sa	everything back to the start of the current grammatical construct
su	the entire utterance (start over)

> **mi klama si cadzu le zarci**
>
> *I go— I mean walk to the store.*

> **mi pu klama sa mi ca cadzu le zarci**
>
> *I went— [erase] I am now walking to the store.*

si is like a backspace key; **sa** is like erasing a whole phrase; **su** is "never mind, starting over."

These have no grammatical role in the text — they are metalinguistic operations on the stream of words. They are most useful in real-time speech but can appear in written texts to represent speech authentically.

Note: **si** erases only the single preceding word, not any free modifiers or indicators attached to it.

---

pau: Question Pre-Marker

pau before a sentence marks it as a question even before the question word appears:

> **pau xu do klama**
>
> *Is it the case that you go?*
>
> (pau = "I'm asking...")

Normally **xu** already signals a question, but **pau** makes the questioning *intent* explicit from the start — useful in spoken Lojban where you want to signal "this is a question" early.

paunai marks a *rhetorical question* — one that looks like a question but isn't:

> **paunai ma zmadu le ka certu mi**
>
> *[Rhetorical:] Who is more expert than me?*
>
> (nobody, obviously)

Hesitation: .y.

.y. (selma'o Y) is Lojban's formal hesitation sound — the equivalent of English "uh" or "er". It requires pauses on both sides and can be held or repeated as long as needed:

> **mi klama .y. le zarci**
>
> *I go... uh... to the store.*

Unlike a pause, **.y.** explicitly signals you still have the floor. It is not grammatical in the middle of a word but may appear anywhere else — including between *sumti*, after connectives, or mid-*tanru*.

Hesitation: .y.

fa'o: End of Text

fa'o (selma'o FAhO) explicitly marks the end of a text. It is almost always omitted but exists for contexts where an unambiguous end-signal matters:

- In computer interaction, to signal end-of-input/output
- In conversations, to explicitly yield the floor
- In written text, to mark an unambiguous stop point

fa'o is *outside the regular grammar* — the parser stops unconditionally when it encounters it (unless quoted with **zo** or **lo'u…le'u**). It cannot appear inside **lu…li'u** quotations or **to…toi** parentheticals.

> **mi klama le zarci fa'o**
>
> *I go to the store. [End of text]*

cmavo Interaction Rules

Several structural *cmavo* affect parsing at a level *before* normal grammar is applied. Key rules:

- **zo** quotes the *immediately following word*, no matter what it is — even **si**, **fa'o**, another **zo**, etc.
- **si** erases the *preceding word* (but not if that word is **zo**)
- **sa** erases the *preceding word and the current grammatical construct* it belongs to
- **su** erases the *entire current utterance*
- **lo'u … le'u** quotes all words between them literally (including most special *cmavo*)
- **zei** combines the *preceding and following word* into a *lujvo*, but cannot combine **zo**, **si**, **sa**, **su**, **lo'u**, ZOI, **fa'o**, or another **zei**
- **BAhE** (ba'e, za'e) marks *the following word* — unless that word is **si/sa/su** or follows **zo**
- **bu** converts the *preceding word* into a letter word (lerfu) — cannot combine with **zo**, **si**, **sa**, **su**, **lo'u**, ZOI, **fa'o**, **zei**, BAhE, or another **bu**
- **UI/CAI** mark *the preceding word* — except **zo**, **si**, **sa**, **su**, **lo'u**, ZOI, **fa'o**, **zei**, BAhE, **bu**; a following **nai** is absorbed into the UI
- **.y.**, **da'o**, **fu'e**, **fu'o** behave like UI but do *not* absorb a following **nai**

Elidable Terminators

Every construction that opens in Lojban has a corresponding terminator *cmavo*. Most are elidable — omittable when unambiguous. The full list:

Terminator	Opens	Closes
be'o	BE	*sumti* attached to *tanru* units (be…bei chains)
boi	PA/BY	number or lerfu strings
do'u	COI/DOI	vocative phrases
fe'u	FIhO	ad-hoc modal tags (fi'o + *selbri*)
ge'u	GOI	relative phrases (pe, ne, po, etc.)
kei	NU	abstraction *bridi* (nu, ka, ni, du'u, etc.)
ke'e	KE	groups: ke…ke'e in *tanru* or connectives
ku	LE/LA	description *sumti* (le, la, lo, etc.)
ku'e	PEhO	forethought mekso (mathematical expressions)
ku'o	NOI	relative clauses (poi, noi, voi)
li'u	LU	Lojban text quotations (lu…li'u)
lo'o	LI	number *sumti* (li…lo'o)
lu'u	LAhE/NAhE+BO	*sumti* qualifiers (la'e, tu'a, na'ebo, etc.)
me'u	ME	*tanru* units formed from *sumti* (me…me'u)
nu'u	NUhI	forethought termsets (nu'i…nu'u)
se'u	SEI/SOI	metalinguistic insertions (sei…se'u)
te'u	various	mekso conversion constructs
toi	TO	parenthetical remarks (to…toi, to'i…toi)
tu'u	TUhE	grouped sentences/paragraphs (tu'e…tu'u)
vau	(none)	simple *bridi* or *bridi*-tails
ve'o	VEI	mekso parentheses

When must you keep the terminator?

Elision is legal only when the parser can determine unambiguously where the construction ends. The main cases where you *must* keep the terminator:

- **ke'e** in mid-*tanru* (if more *tanru* follow the group)
- **kei** when an abstraction's x_2 follows (e.g., **le su'u … kei be lo fasnu**)
- **ku** before a *selbri* whose first word looks like a *sumti*-following word
- **vau** in compound *bridi* with tail-terms (**gi'e…vau do**)
- **fe'u** before a non-logical connective immediately after a fi'o-modal

In practice, most speech and writing elides nearly all terminators. The rule is: if elision causes ambiguity, keep the terminator.

MAI: Ordinal Discourse Markers

MAI *cmavo* (selma'o MAI) attach to a number to create discourse ordinals — words that signal position in a sequence of points or topics. They are attitudinal-like: they color the sentence they begin without contributing to the *bridi*'s truth conditions.

Form	Meaning
pamai	firstly / first of all
remai	secondly
cimai	thirdly
…	…
romai	lastly / finally

> **pamai mi djuno lo du'u tcima ba carvi**
>
> *First, I know it will rain.*

> **remai le pa'o cu spofu**
>
> *Second, the umbrella is broken.*

> **romai mi ba xabju le zdani**
>
> *Finally, I will stay home.*

MAI always attaches directly to a preceding number (no space in speech): **pamai**, **remai**, **cimai**. The number and **mai** form a single *cmavo*-like unit.

romai specifically means "last in this series" — not "always" or "every time." It marks the final item without specifying how many items there were total.

MO'O: Section and Chapter Ordinals

Where **MAI** marks items in a list, **MO'O** (selma'o MOhO) marks larger structural divisions — sections, chapters, stanzas, or other named divisions of a text:

Form	Meaning
pamo'o	section 1 / Chapter 1
remo'o	section 2 / Chapter 2
cimo'o	section 3
…	…

> **pamo'o le cmene be le lojbo**
>
> *Section 1: The Name of Lojban*

> **remo'o le gismu**
>
> *Section 2: The Root Words*

MO'O differs from **MAI** in that it names a section *heading* — it typically appears at the start of a major structural block, not in the middle of argument:

- **MAI** = "this point is first/second in my argument"
- **MO'O** = "this block of text is section 1/2 of the overall document"

Both **MAI** and **MO'O** can be combined with the **xi** subscript for nested numbering:

> **pamo'o xi re** = Section 1.2 **remo'o xi pa** = Section 2.1 **pamai xi ci** = point 1.3 in a nested list

---

xi: Subscript Rules (Text Structure Context)

xi (selma'o XI) attaches a subscript to the *preceding* word. It is used throughout Lojban — on pro-*sumti*, letters, number words, and discourse markers. Key rules for text structure:

1. **xi** always follows the word it subscripts: **ko'a xi re** = ko'a$_2$
2. The subscript can be a number: **da xi mu** = x$_5$
3. The subscript can be a letter string: **ko'a xi by.** = ko'a$_\beta$
4. Subscripts nest via xi chains: **ko'a xi pa xi re** = ko'a$_{1.2}$
5. **xi** can extend any finite series: **fa xi xa** = the 6th place tag; **ni'o xi re** = second-level topic shift

For text structure, the most common uses are:

- Nested sections: **pamo'o xi re** = §1.2
- Nested list items: **remai xi ci** = item 2.3

Same *cmavo* elsewhere: xi also tags extra **FA** places (**fa xi xa**), logical variables (**da xi re** in Chapter 21), and math or letter variables (**xy. xi pa** in Chapter 18). For a survey of "what can be subscripted," see the **xi (subscript)** section in Chapter 18 (math variables) and Chapter 21 (logical variables).

Questions & answers: one protocol (hub)

Questions and answers are spread across several chapters of this book. Friendly chapters spread the **pedagogy** (Chapter 6 — content questions; Chapter 8 — connective questions; Chapter 7 — **pei**; Chapter 13 — **na** / **ja'a** answers). This subsection is the **single roadmap**: question devices, what you may answer with, and where to read the lessons.

Fill-in-the-blank questions place a question *cmavo* **where the answer would go**. The answer often **need not be a full bridi** — it completes the open claim of the question (see the question/answer table below).

Ask for…	Device	Typical answer	Taught in
truth of the *bridi*	**xu**	**go'i**, **na go'i**, **ja'a go'i**, **je'u**, or a corrected *bridi*	Ch.6, Ch.13
a *sumti*	**ma** (several **ma** = several blanks, in order)	*sumti*	Ch.6
a *selbri*	**mo**	*selbri* or *bridi*	Ch.6
a number	**xo**	**PA** / **li**-able number	Ch.6, Ch.18
which connective	**ji**, **je'i**, **gi'i**, **ge'i**, **gu'i**	bare **ek** / **jek** / **gihek** / **gek**	Ch.8
tense or modal	**cu'e**	tense *cmavo* or **BAI** / **fi'o**	Ch.6, Ch.9, Ch.10
place tag	**fi'a**	**FA** *cmavo*	Ch.6
attitude strength	**pei**	**UI**	Ch.7

Parallel questions with fa'u: Chapter 8 explains **fa'u** ("respectively") for statements. The same pattern pairs **ma** slots:

> **ma fa'u ma klama ma fa'u ma**
>
> *Who and who goes where and where, respectively?*

> **la .djan. fa'u la .marcas. le zarci fa'u le briju**
>
> *John and Marsha [go] to the store and to the office, respectively.*

Answers may be grammatical **without** repeating the whole *bridi*. Mechanical substitution of answer into question can look odd until elided terminators are mentally restored — the elision rules are covered in Chapter 21.

Kinds of non-*bridi* answer (not an exhaustive list): one or more *sumti*; a bare connective; a number or parenthesized mekso; **na** or **ja'a**; a relative clause hanging on a prior *sumti*; a prenex; **be**/**bei** linked to a prior *selbri*; at the **start** of a text, bare names, indicators, or vague **nai**. See the table above and the chapters on negation, connectives, and logic.

Summary

Sentence / text structure:

- **.i** = sentence separator (between sentences)
- **ni'o** = new topic; **no'i** = resume old topic
- **zo'u** = topic-comment separator; also introduces quantifier prenex
- **da'o** = cancel pronoun assignments

Quotation types:

- **lu … li'u** = direct Lojban quote
- **zo** = single-word quote
- **zoi gy. … .gy.** = foreign text quote
- **lo'u … le'u** = error/fragment quote
- **la'o gy. … .gy.** = foreign name as *sumti*

Sumti qualifiers (LAhE):

- **la'e** = referent of; **lu'e** = symbol for
- **tu'a** = something involving (vague event); **lu'a** = a member of
- **lu'i** = the set of; **lu'o** = the mass of; **vu'i** = the sequence of

Emphasis and nonce:

- **ba'e** = emphasize next word; **za'e** = nonce coinage

Ordering:

- **pamai/remai/romai** = firstly/secondly/lastly; **pamo'o/remo'o** = section 1/2

Attitudinal scope:

- **fu'e** = open scope; **fu'o** = close scope

Parentheticals and metalinguistics:

- **to … toi** = spoken parentheses (any content, invisible to parser)
- **to'i … toi** = editorial/quoted parenthesis
- **sei … se'u** = metalinguistic sub-*bridi* (grammatical *bridi*, comments on discourse)

Self-correction (erasers):

- **si** = erase previous word; **sa** = erase current construct; **su** = erase utterance

Other:

- **me … me'u** = *sumti*-to-*selbri* conversion
- **pe'a** = metaphorical use marker
- **pau** = question pre-marker (nai = rhetorical question)

Questions & answers (hub):

- One table + **ma fa'u ma** example + non-*bridi* list — see **Questions & answers: one protocol (hub)** above; detail in Ch.6 / Ch.8 / Ch.13

Hesitation and end-of-text:

- **.y.** = formal hesitation sound (holds the floor; requires pauses on both sides; can be dragged out)
- **fa'o** = explicit end of text (outside regular grammar; parser stops unconditionally)

Summary

cmavo interaction priorities (processed before normal grammar):

- **zo** quotes the immediately following word unconditionally
- **si/sa/su** erase; **lo'u…le'u** quotes literally; **zei** compounds two words into *lujvo*
- **BAhE** marks following word; **bu** converts preceding word to lerfu; **UI/CAI** mark preceding word
- **.y.**, **da'o**, **fu'e**, **fu'o** behave like UI but do *not* absorb a following **nai**

Elidable terminators (full list):

- **be'o** (BE), **boi** (PA/BY), **do'u** (COI/DOI), **fe'u** (FIhO), **ge'u** (GOI)
- **kei** (NU), **ke'e** (KE), **ku** (LE/LA), **ku'e** (PEhO), **ku'o** (NOI)
- **li'u** (LU), **lo'o** (LI), **lu'u** (LAhE), **me'u** (ME), **nu'u** (NUhI)
- **se'u** (SEI), **te'u** (mekso), **toi** (TO), **tu'u** (TUhE), **vau** (*bridi*), **ve'o** (VEI)
- Keep terminator when elision is ambiguous; **kei be** = must keep before abstractor x_2

Chapter 18. Letters, Numbers & Math

The Lojban Alphabet: lerfu

Each letter of the Lojban alphabet has a name — a *cmavo* of selma'o BY. These are used to spell words, give initials, or refer to letters as objects.

Vowel letters:

Letter	Name
a	**.abu**
e	**.ebu**
i	**.ibu**
o	**.obu**
u	**.ubu**
y	**ybu**

Consonant letters follow the pattern Cy (consonant + y):

Letter	Name	Letter	Name
b	**by.**	m	**my.**
c	**cy.**	n	**ny.**
d	**dy.**	p	**py.**
f	**fy.**	r	**ry.**
g	**gy.**	s	**sy.**
j	**jy.**	t	**ty.**
k	**ky.**	v	**vy.**
l	**ly.**	x	**xy.**
		z	**zy.**

Apostrophe is named **.y'y.** and **period/pause** is **.denpa bu**.

Spelling Words

To spell a word, list its lerfu in sequence:

> **zo lojban cu se lerfu ly. .obu jy. by. .abu ny.**
>
> *"lojban" is spelled l-o-j-b-a-n.*

Letter strings can be used as *sumti* directly: **ly. .obu jy. by. .abu ny.** = "lojban" (as a string of letters).

bu is a *cmavo* that turns *any* Lojban word into its letter name:

> **la .alis. bu** — the letter/symbol "Alice" (Alice used as a symbol) **lo skami bu** — the symbol "skami"

This is how arbitrary symbols and single-character names are created on the fly.

Numbers: PA *cmavo*

The ten digits are single *cmavo*:

Digit	Lojban
0	**no**
1	**pa**
2	**re**
3	**ci**
4	**vo**
5	**mu**
6	**xa**
7	**ze**
8	**bi**
9	**so**

Numbers are written by concatenating digits left-to-right (most significant first):

> **parebici** = 1283 **rezevomu** = 2745

Two-digit values work the same way: **pa no** = 10, **pa pa** = 11, **ci mu** = 35.

Special number words:

Word	Meaning
ro	all / every
su'o	at least one / some
me'i	less than
za'u	more than
du'e	too many
mo'a	too few
rau	enough
piso'a	almost all
xo	how many? (question)

Number Bases and Fractions

pi is the decimal point:

> **ci pi vo** = 3.4 **pamu** = 0.5 (half)

Numbers as selbri (PA as *brivla*-like): a number alone acts as a quantifier or a predicate:

> **le ci gerku** = the three dogs **mi ci** = I am three (I am the third) **pa le gerku cu blabi** = one of the dogs is white

fi'u = fraction separator:

> **pa fi'u re** = 1/2 **ci fi'u vo** = 3/4

ma'u / ni'u = positive / negative sign:

> **ni'u re** = −2 **ma'u mu** = +5

Mathematical constants (PA *cmavo* standing alone):

cmavo	Value
pai	π (pi, ≈ 3.14159…)
te'o	e (Euler's number, ≈ 2.71828…)
ci'i	∞ (infinity)
ci'i no	$\aleph_0$ (aleph-null, countable infinity)

> **li pai su'i te'o** = π + e

ki'o = comma separator (thousands):

> **pa ki'o** = 1,000 **re ki'o vo no no** = 2,400

ce'i = percent sign (follows the number):

> **ci mu ce'i** = 35% **pamu ce'i** = 50%

ka'o = imaginary-unit separator for complex numbers:

> **ci ka'o re** = 3+2i (three plus two-i) **ni'u pa ka'o vo** = −1+4i

Ordinal Numbers

Place **moi** after a number to get an ordinal:

> **pamoi** = first **remoi** = second **cimoi** = third

> **mi pamoi klama** = I am the first to go. **le remoi prenu** = the second person

mei makes a number into "a set/group of N":

> **le ci mei** = the trio / the group of three

Math: mekso

Lojban has a full mathematical expression system called **mekso** ("mathematical expression"). It is designed to be unambiguous — operator position, parentheses, and precedence are all explicit.

li — Math Expressions as Sumti

li introduces a numeric or mathematical expression as a *sumti* (a number-as-object):

> **li ci su'i vo du li ze**
>
> *The number (3 + 4) equals the number 7.*

du = equals (mathematical identity). The whole mekso expression follows **li**.

Operator Order

Mekso supports two operator positions:

Infix (operator between operands) — most natural for simple expressions:

> **li re su'i ci** = 2 + 3 = 5 **li mu vu'u re** = 5 − 2 = 3 **li re pi'i ci** = 2 × 3 = 6

Polish / forethought (operator before operands) — unambiguous for nested expressions:

> **li su'i re ci** = +(2, 3) = 5

In practice, infix is most common for simple arithmetic. For complex nested expressions, **vei…ve'o** parentheses make infix equally unambiguous.

vei … ve'o — Parentheses in Mekso

vei opens a parenthesized sub-expression; **ve'o** closes it:

> **li vei re su'i ci ve'o pi'i vo du li re no**
>
> *(2 + 3) × 4 = 20*

Without **vei**, **bi'e**, or a **ti'o** precedence declaration, infix **VUhU** operators group **left to right** (like a simple calculator) — **not** automatic "multiplication before addition" . So **li re su'i ci pi'i vo** means **((2 + 3) × 4) = 20**, not 14.

> **li re su'i vei ci pi'i vo ve'o —**
>
> *2 + (3 × 4) = 14*

Explicit **vei/ve'o** stays the clearest fix; **bi'e** (below) is the compact alternative.

bi'e — higher-precedence operators (compact infix)

Prefix **bi'e** to a **VUhU** operator (selma'o **BIhE**) so that operator binds **before** neighbors that lack **bi'e** — the standard Lojban way to get "multiply before add" on one line:

> **li ci su'i vo bi'e pi'i mu du li reci**
>
> *3 + (4 × 5) = 23*

If several operators carry **bi'e**, grouping is **from the right**; **bi'e bi'e** on a single operator is not allowed. When a formula gets busy, prefer **vei … ve'o** or split across sentences.

Logical connectives within mekso

Operands and operators follow the **same** connective classes as ordinary language: **sumti**-style **eks** (**.e**, **.a**, …) between operands, **jek**s (**je**, **ja**, …) between **VUhU** operators (Chapter 8). A few consequences:

- **Quantifiers** often wrap mekso in **vei … ve'o** when the number is not a single PA:

> **vei ci .a vo ve'o prenu cu klama le zarci**
>
> *Three or four people go to the market.*

- **lo'o** closes **li** when the next connective belongs to the **outer** sentence, not to the mekso:

> **li re su'i re du lo'o .ije …**
>
> *Two plus two equals …, **and** …*

⚙️ **Operators** can be joined (contrived but grammatical):

> **li re su'i je pi'i re du li vo**
>
> *Two [plus and times] two equals four.*
>
> (parallel to **su'i je pi'i** as a connected operator cluster)

CLL has full tables for operand/operator connection and for **ke**-grouping of operators; for textbook prose, prefer explicit **vei/ve'o** and separate sentences until you need this density.

Full VUhU Operator Table

VUhU operators are used in mekso (mathematical expressions). They work in infix (between operands) or in Polish/forethought notation (before operands).

cmavo	Operation	Arity	Example
su'i	addition (+)	binary	**re su'i ci** = 5
vu'u	subtraction (−)	binary	**mu vu'u re** = 3
pi'i	multiplication (×)	binary	**re pi'i ci** = 6
fe'i	division (÷)	binary	**xa fe'i re** = 3
te'a	exponentiation (^)	binary	**re te'a ci** = 8
ne'o	factorial (n!)	unary, postfix	**mu ne'o** = 120
de'o	logarithm (log_b of n)	binary	**de'o re boi bi** = $\log_2(8) = 3$
fe'a	root (n-th root of m)	binary	**fe'a re boi bi** = $\sqrt{8} \approx 2.83$
ge'a	absolute value (	n	)
gei	scientific notation (× 10^n)	binary	**ci gei bi** = 3×10^8
pi'a	vector/matrix row joining	binary	constructs vectors
sa'i	matrix column joining	binary	constructs matrices
fu'u	n-ary operation (unspecified)	n-ary	general placeholder
sa'o	derivative operator	unary/binary	calculus
ji'i (PA)	approximately equal to	(quantifier in number context)	

Unary operators take one operand; **binary** take two. When used as VUhU in Polish notation, the operand count must be satisfied: **su'i re ci** = +(2,3) = 5 (binary, both operands follow).

The **boi** separator distinguishes multiple operands when two numbers would otherwise run together:

> **de'o re boi bi** = log base 2 of 8 (**boi** separates the base "re" from the argument "bi")

Special Number Words in Detail

Beyond simple digits, the PA *cmavo* include several "fuzzy" quantity words:

cmavo	Meaning
ro	all / every
su'o	at least one / some (existential)
su'e	at most N
su'o re	at least two
du'e	too many
mo'a	too few
rau	enough
za'u	more than N
me'i	fewer/less than N
ji'i	approximately / roughly N
piso'a	almost all
piro	all of (used with masses)
xo	how many? (question)

> **ji'i panono prenu pu klama**
>
> *Approximately 100 people came.*

> **za'u re nanmu cu zvati**
>
> *More than two men are present.*

me'o introduces a numeral as a *symbol* (not evaluated as a quantity):

> **me'o xy.** = the symbol x (as a variable name, not a number) **me'o paremubi** = the string "1-2-8" as a symbolic label

na'u and ni'e: Connecting Mekso with Selbri

na'u converts a VUhU operator into a **selbri** usable in a regular Lojban *bridi*. The resulting *selbri* has the place structure of the underlying mathematical relation.

Worked example — na'u su'i (addition as *selbri*):

The VUhU **su'i** (addition) has the implicit place structure:

- x_1 = the sum
- x_2 = one addend
- x_3 = the other addend

When promoted to *selbri* via **na'u**:

> **li mu na'u su'i re ci**
>
> *5 is the sum of 2 and 3.*
>
> Literally: 5 [is-x_1-of addition] 2 3

> **li re na'u su'i ci du li mu**
>
> *2 + 3 = 5*
>
> (using **du** = "equals" to close the equation)

You can use SE conversion on **na'u**-*selbri*:

> **li re na'u se su'i mu**
>
> *2 is an addend summing to 5*
>
> (se shifts $x_1 \leftrightarrow x_2$: now x_1 is an addend, x_2 is the sum)

Another example — **na'u pi'i** (multiplication as *selbri*):

> **li xa na'u pi'i re ci**
>
> *6 is the product of 2 and 3.*

> **la meris. cu se zmadu la .alis. lo ka barda**
>
> *Mary exceeds Alice in bigness.*
>
> (non-mekso parallel)

The power of **na'u** is that it lets you make *claims* about mathematical relationships using the full Lojban logical and quantifier system:

> **ro da poi kacna'u zo'u su'o de poi kacna'u zo'u da na'u su'i de du li no**
>
> *For every integer, there is some integer whose sum with it equals zero.*

(additive inverses)

ni'e converts a *selbri* into a **mekso operand** — the *selbri*'s x_1 determines the numeric value:

li ni'e melbi pi'i re

The beauty-value times two

(treating "beauty" as a numeric measure)

mo'e converts any *sumti* (often a **ni** abstraction) into a mekso operand:

li mo'e le ni le pixra cu blanu

the number representing how blue the picture is

MOI: Quantifier Selbri

moi and **mei** turn numbers into *selbri*. The full MOI series:

cmavo	x_1 is…	Example
moi	the Nth member of set x_2	**mi pamoi** = I am first
mei	a group of N from x_2	**le ci mei** = the group of three
si'e	an Nth portion / fraction of x_2	**le pimu si'e le plise** = half the apple
cu'o	an event with probability N	**le nu carvi cu pimu cu'o** = 50% chance of rain
va'e	at level N on scale x_2	**mi ci va'e melbi** = I am beauty-level 3

mi pamoi klama = I am the first to go. **le remoi prenu** = the second person. **le pimu si'e le plise cu fusra** = Half the apple is rotten. **le nu carvi cu pano cu'o** = There is a 10% probability of rain. **do vo va'e certu** = You are a level-4 expert.

Subscripts: xi

xi attaches a subscript (a number or letter string) to almost any word:

Subscripts: xi

> **ko'a xi pa** = ko'a$_1$; **ko'a xi re** = ko'a$_2$ **fa xi xa** = the 6th place tag (extending beyond the standard fa/fe/fi/fo/fu) **da xi vo** = x_4 (logical variable with subscript)

Subscripts allow infinite extension of any finite *cmavo* series. They are particularly useful for:

- Extending logical variables: **da xi pa, da xi re, da xi ci** = x_1, x_2, x_3
- Tracking multiple discourse referents: **ko'a xi pa** = "the first one", **ko'a xi re** = "the second one"
- Math variables: **xy. xi pa** = x_1 (the symbol x subscript 1)

Spelling and Letterals in Depth

bu: The Universal Letter-Maker

bu following *any* Lojban word converts it to a lerfu (a letter or symbol) representing that word:

> **zo coi bu** = the symbol "coi" (the word coi treated as a single glyph/symbol) **la bu** = the symbol "la" **mi bu** = the symbol "mi" (useful for algebra-like notation)

This lets you create symbols for any concept on the fly.

Letterals as Pro-Sumti

Outside math contexts, lerfu strings (like **.abu, xy.**) act as a second set of assignable pronouns alongside **ko'a...ko'u**:

> **.abu cu klama** — .abu goes (tracking a referent) **xy. du li re** — x = 2 (math variable) **da xi pa zo'u xy. xi pa du da xi pa** — x_1 = da$_1$ (linking symbolic to logical)

This extends the Lojban pronoun system almost without limit.

Upper and Lower Case: ga'e, to'a, tau

Lojban does not capitalize sentences or names. Capital letters only appear inside Lojbanized names to mark *irregular stress* (e.g., **.iVAN.**). To spell out names with capital letters, use the shift words:

cmavo	selma'o	Effect
ga'e	BY	shift following letterals to UPPER CASE
to'a	BY	shift back to lower case
tau	LAU	shift only the *immediately following* letteral to upper case (single-shift)

ga'e and **to'a** are persistent — they stay in effect until contradicted:

.ibu ga'e vy. .abu ny. to'a

i V A N

(the name "Ivan" with Russian capitals)

tau shifts only one letter, then reverts. Useful for chemical element symbols:

tau sy. = S (upper-case S = sulfur symbol) **tau sy. .ibu** = Si (silicon: upper S then lower i)

If a global upper-case shift (**ga'e**) is active, **tau** reverses it for that one letter (producing lower case).

Compound Letterals: tei ... foi

tei and **foi** create a *compound lerfu* — multiple letters treated as a single, indivisible symbol:

tei xy. ny. foi = the compound symbol "xn" (treated as one unit)
tei .abu xy. foi = the symbol "ax"

This is needed when a lerfu string should be interpreted as a *single symbol* rather than separate letters in sequence. Useful for creating multi-character variable names.

tei/foi are also essential for accent marks in foreign words. Accent marks have their own lerfu words, but the ordering (mark before or after the base letter?) is language-specific. **tei...foi** removes the ambiguity by grouping base + mark into one unit:

tei .ebu .akut.bu foi ty. tei .akut.bu .ebu foi

(é) t (é)

— spells French

été

unambiguously

The acute accent is **.akut.bu** (the name **akut.** + **bu**). It doesn't matter whether it comes before or after **.ebu** inside the **tei...foi** brackets — the grouping guarantees association.

Similarly, **tei** handles multi-letter digraphs that some languages treat as single letters:

tei ly. ly. foi = the Spanish

ll

(a single letter in traditional Spanish)

me'o: Referring to the Letter Itself

When a lerfu string appears in running Lojban text, it acts as a *pro-sumti* (a pronoun — see Letterals as Pro-Sumti above). This means **.abu** is interpreted as "the thing previously assigned to .abu", not as a reference to the letter *a*.

To refer to the *letter itself* — to say "a is a letteral" — use **me'o**:

> **.abu cu lerfu ✗** — attempts to find a previous referent named .abu
> **me'o .abu cu lerfu ✓** —
>
> *The expression "a" is a letter.*

me'o (selma'o LI) is the "mathematical expression" introducer. It signals: treat what follows as the *symbol itself*, not as a reference to what the symbol denotes.

> **me'o xy. cu se lerfu la .alis.**
>
> *The letter "x" is used in Alice's name.*

> **dei vasru vo lerfu poi me'o .ebu**
>
> *This sentence contains four instances of the letter "e".*

Contrast with quoting:

	Form	Meaning	Correct for	
	lu .abu li'u	"the word .abu"	the *cmavo* form	
	la'e lu .abu li'u	the referent of the word .abu	what .abu points to	
	me'o .abu	the letter a	the lerfu itself	

Spelling Words Aloud

To spell a word letter by letter:

> **la .alis. cu se lerfu .abu ly. .ibu sy.**
>
> *"Alice" is spelled a-l-i-s.*
>
> (simplified spelling)

To assemble letters back into a word, use **lu'o** (mass of) to collect the lerfu into a single word-object:

> **lu'o .aby ly .ibu sy. du zo alis**

> *a+l+i+s = "alis"*
>
> (the mass of these letters equals the word alis)

Quoting Rafsi and Non-Words

lo'u...le'u quotes non-grammatical strings. For *rafsi* and morphological fragments:

> **lo'u kla le'u** = the
>
> *rafsi*
>
> "kla" (for klama) **lo'u -alis- le'u** = the fragment "-alis-" as a string

---

Counting and Measurement

la'u + number = measurement tag (how much):

> **la'u li mu** = for a quantity of five / by fives

Comparisons are clearest with **zmadu** / **mleca** and a **ka** property (see Chapter 14); **mau** / **me'a** as BAI tags often want **se** conversion in real text.

> **mi zmadu do le ka barda**
>
> *I am bigger than you.*

> **le zarci cu mleca le zdani le ka barda**
>
> *The store is smaller than the house (in size).*

Forethought Operators: Polish Notation in mekso

Standard mekso uses **infix** operators (between operands). Lojban also supports **forethought** (Polish notation) where the operator comes first, before its operands. This is marked by **pe'o**:

> **pe'o su'i ci vo** = +(3, 4) = 7

> **li pe'o su'i ci vo du li ze**

> *3 + 4 = 7*
>
> (Polish form)

Forethought is more explicit and unambiguous because the operator comes first and the operands follow in order. It's closer to function notation:

> **pe'o pi'i re ci vo** = ×(2, 3, 4) = 24 (three-argument multiplication)

The **ku'e** terminator closes a forethought expression when there could be ambiguity about how many operands were taken.

Forethought in complex expressions:

> **pe'o su'i pe'o pi'i re ci pe'o pi'i vo mu** = +(×(2,3), ×(4,5)) = 6 + 20 = 26

No parentheses needed — the nesting is unambiguous because each **pe'o** expression takes exactly as many operands as the operator requires.

Non-Decimal Bases

By default, Lojban numbers are base 10. To express a numeral string in another base, use the **VUhU** operator **ju'u** between the number-in-that-base and the base (see the **Bases** section in this chapter above for full detail). Digits **pa** through **so** still mean 1–9; bases above 10 use extra digit *cmavo* (**dau**, **fei**, …).

> **li panopano ju'u re du li pano**
>
> *The number [written] 1010 in base 2 equals [decimal] 10.*

> **li daufeigai ju'u paxa du li rezevobi**
>
> *The number [written] ABC in base 16 equals [decimal] 2748.*

Only digit values valid in the chosen base may appear on the left of **ju'u** (e.g. do not use **re** as a digit in base 2).

ra'o (selma'o **RAhO**) flags a **GOhA** pro-*bridi* so that pro-assignments inside the copied *bridi* are updated for the new context — the standard device for "viewpoint shift" in indirect speech, not a general pronoun reset (use **da'o** for assignable *sumti*).

Reverse Polish Notation

Besides prefix (forethought) and infix, mekso also supports **postfix** (Reverse Polish Notation / RPN), common in HP calculators and Forth:

fu'a (selma'o **FUhA**) marks the start of an RPN expression.

> **fu'a ci vo su'i** = 3 4 + (the operator comes after both operands) = 7

> **fu'a re ci pi'i vo su'i** = 2 3 × 4 + = (2×3)+4 = 10

RPN is unambiguous without parentheses when operator arity is known. It's rarely used in everyday Lojban but is provided for completeness (and for stack-machine enthusiasts).

Mekso: vectors, indefinite numbers, precedence, and word problems

This block lines up with places where the preceding sections have been lighter: arrays, fuzzy counts, formal precedence, and a worked "story problem."

Vectors and matrices: jo'i, pi'a, sa'i

A **vector** is a fixed list of simple operands. **jo'i** (selma'o **JOhI**) opens the list; **boi** separates components; **te'u** closes (often elidable when unambiguous):

> **li jo'i paboi reboi te'u su'i jo'i ciboi voboi te'u du li jo'i voboi xaboi te'u**
>
> *(1, 2) + (3, 4) = (4, 6).*

pi'a stacks row-vectors into a matrix; **sa'i** stacks column-vectors. Extra rows/columns chain with the same operator (CLL uses **ge'a** between operands when needed). A compact **2×2**:

> **li jo'i paboi reboi pi'a jo'i ciboi voboi**
>
> *The matrix with rows (1, 2) and (3, 4).*

The classic 3×3 "magic square" from CLL is built the same way with three **jo'i …** operands joined by **pi'a** (or three columns joined by **sa'i**). When you combine matrices with other operators, wrap in **vei … ve'o** so grouping stays obvious.

Indefinite PA (and roi)

Besides **ji'i**, **za'u**, **me'i**, **su'e**, **su'o** (already above), Lojban has **so'a**, **so'e**, **so'i**, **so'o**, **so'u** — five **objective** indefinite sizes **below ro**, in **decreasing** order (roughly: almost all ⟶ … ⟶ a few). They are still vague: **so'e** is *not* "more than half" by rule.

pi-prefixed forms (**piro**, **piso'a**, …) talk about **parts of a whole** (masses), not "N items out of a bag." **no'o** is "the typical amount" (not necessarily a statistical mean — see CLL).

Those *cmavo* usually quantify **sumti**. Inside **li**, prefer explicit arithmetic, **ji'i**, or bounds (**su'o re** … **su'e mu**) when you need a numeric claim with slack.

Digit + roi is **not** a mekso operator: it builds **tenses** like English *once*, *twice* (e.g. **pare roi**, **reroi**) — see Chapter 9 and Chapter 21 for samples.

Explicit operator precedence (ti'o)

CLL describes **ti'o** (with **sei**-family syntax) as a place to declare **relative precedence** among **VUhU** operators for future parsers. **Current** practice: default infix is **left-to-right** (see **bi'e** under *Operator Order*); spell school-math grouping with **vei … ve'o** or **bi'e**, or use forethought **pe'o** / **fu'a**. Do not assume readers apply "PEMDAS" unless you mark it.

nu'a — operator into *selbri* (inverse of na'u)

nu'a wraps a **VUhU** *cmavo* as an ordinary **selbri** (inverse of **na'u**). One CLL-style illustration:

> **li ni'umu cu nu'a va'a li ma'umu**
>
> *–5 is the negation-as-operation applied to +5.*

Together, **na'u** and **nu'a** let you **answer** "which operator?" questions without a dedicated operator-question *cmavo* (CLL §18.19).

"Four score and seven" — the number 87

A *score* is 20 (like a *dozen* is 12). **Four score and seven** = 87. Several honest Lojban renderings:

> **li bize** — plain **87** (correct, dry).

> **li vo pi'i reno su'i ze** —
>
> *four times twenty, plus seven.*

> **li vo pi'e ze ju'u reno** —
>
> *digit string "4;7" read in base 20*
>
> (French
>
> *quatre-vingt-sept*
>
> flavor).

CLL also discusses **mo'e** with **mei**-style *sumti* (**voboi renomei**, "four twentysomes") to mimic "four groups of twenty" before adding seven; the same pattern works in this chapter — **te'u** closes the **mo'e** expression when needed; see the **Sumti as operands** section above.

mai and mo'o — “firstly…”, section numbers

mai (selma'o **MAI**) turns a **digit string** or **lerfu string** into a **free modifier**: an outline label like English *firstly*, *secondly*, *nth*, or *lastly*.

> **pamai** —
>
> *firstly*
>
> **remai** —
>
> *secondly*
>
> **romai** —
>
> *lastly*
>
> (literally “all-thly”)

> **ny.mai** —
>
> *nth*
>
> (after **ny.** as “n”)

mo'o is the same idea for **larger** chunks of structure: chapters vs paragraphs, acts vs scenes. A **pasomo'o** line marks a high-level slice; inside it you might still use **pamai** / **remai** for steps. Full discussion of **moʻo** in text structure is in Chapter 17.

Grammar note: there is **no boi** between the number/lerfu string and **mai** / **roi** (same rule family) — see the **mai / mo'o** section above in this chapter.

---

bu in Depth: Any Word as a Symbol

bu is not just for common letters — it converts *any* Lojban word into a symbol name. This makes it possible to use arbitrary words as single-character labels:

> **klama bu** = the symbol "klama" (the word treated as a single letter/symbol) **la .teris. bu** = the symbol "T" (using the name Terry as a symbol) **lo gerku bu** = the symbol "dog" (used as a label)

This extends to create symbols for mathematical or logical variables using recognizable Lojban words:

> **prenu bu** = p (person symbol) **gerku bu** = g (dog symbol)

And for single punctuation characters or other signs:

> **lidne bu** = a leading-dot symbol **.y'y.** = the apostrophe letter name (already built in) **denpa bu** = the period / pause mark (already built in)

bu is also how you refer to non-Lojban scripts: you can create lerfu words for Greek letters (**alfas.**, **betas.**, etc. using cmene convention), Cyrillic, Hebrew, and others, by combining **bu** with borrowed names.

Acronyms, character codes, punctuation, and script shifts

Acronyms (initials as names): Glue lerfu words into a **cmene**: insert **'** wherever two vowels would touch, and end with a consonant (often repeating the last lerfu's consonant or tagging culture: **merko**, **brito**, ...). Compression: vowel **lerfu** may drop **bu** except **.y.bu**. Alternative: treat the string as a predicate-name with **la me**:

> **la me dy. ny. .abu**
>
> *That which satisfies "d, n, a"*
>
> — usable as a name **DNA**-style, with pauses allowed between lerfu.

se'e (BY) — computerized codes: se'e + a **PA** number is *one character* in an agreed charset (ASCII, Unicode hex with a spoken convention, ...). The hearer must know the table and base.

> **me'o se'e cixa cu lerfu la .asycy'i'is.**
>
> *The expression "code 36" is a letteral in ASCII.*
>
> (36 = dollar sign in ASCII)

Unicode (hex) and "big" scripts: The same **se'e** device works for **Unicode** when everyone agrees you are using **hexadecimal** code points and the Unicode chart — not just ASCII. For Unicode code points, spell them as digit strings with **se'e** acting as a base-16 prefix; for example, **U+262E** (peace symbol ☮) is **me'o se'e rexarerei** (hex digits r·e·x·a·r·e·r·e·i under the **BY** names: re=2, xe=6, reno=2, bi=E). For **CJK** or any long non-Latin passage, **zoi** / **la'o** (Chapter 17) is usually clearer than spelling glyph-by-glyph; **zai** + an alphabet name still switches **BY** strings when you need a short native letter inside Lojban prose (see **zai** / **ce'a** below in this section).

lau (LAU) — punctuation, not letters: lau must be followed by a **BY** word. It marks that the **bu**-symbol names a **punctuation mark** (comma, dash, ...), not an alphabetic letter — important when the same shape could be read either way.

zai (LAU) / ce'a (LAU) — shifts: zai switches which *alphabet* following **BY** words belong to (Latin vs Greek, ...) until cancelled. **ce'a** switches *font* or glyph style (italic, bold, ...). Interpretation depends on agreed conventions.

Raw foreign text: For un-Lojbanized passages, use **zoi** / **la'o** (Chapter 17 — Text Structure & Quotation). Tone digits in **pinyin**-style spellings can sit inside lerfu strings: **.abu ny. vo ...** = *han⁴...*.

Auxiliary lerfu *cmavo* (roadmap): tei/foi (compound glyph); **ga'e/to'a/tau** (case); **lau/zai/ce'a** (punctuation / alphabet / font); **se'e** (code point); **me'o/lo'o** (quote expression / close **li**). Not every CLL corner case is needed until you typeset mixed scripts or data protocols.

Summary

Lerfu (letters):

- Vowels: **.abu .ebu .ibu .obu .ubu ybu**
- Consonants: **by. cy. dy.** etc.
- **bu** turns *any* word into a letter/symbol name — extends to any alphabet
- **tei … foi** = compound multi-character symbol (also used to group base letter + accent mark)
- **se'e** + **PA** = numeric character code (ASCII/Unicode by convention — see **Unicode** paragraph under *Acronyms…*); **lau/zai/ce'a** = punctuation / alphabet / font shifts on **BY**
- Acronyms: glue lerfu into **cmene**, or **la me** + lerfu string
- Lerfu strings outside math act as assignable pro-*sumti*

Case shifts:

- **ga'e** = shift all following lerfu to UPPER CASE (persistent until **to'a**)
- **to'a** = shift back to lower case
- **tau** (LAU) = single-shift: next lerfu only to upper case (or lower if **ga'e** active)
- Example: **.ibu ga'e vy. .abu ny. to'a** = *i V A N*

Accent marks:

- Accent marks are lerfu words (e.g. **.akut.bu** = acute accent)
- Use **tei…foi** to bind accent to its base letter unambiguously regardless of order
- **tei .ebu .akut.bu foi** = é (e with acute) — order within tei/foi doesn't matter

me'o — referring to the letter itself:

- Bare lerfu strings (**.abu**, **xy.**) are pro-*sumti* (pronouns), not references to the letter
- **me'o .abu** = the letter *a* itself (selma'o LI; treats what follows as a symbolic expression)
- Contrast: **lu .abu li'u** = the word ".abu"; **la'e lu .abu li'u** = the referent of .abu; **me'o .abu** = the letter a

Numbers (PA):

- Digits: **no pa re ci vo mu xa ze bi so** (0–9)
- Concatenate for multi-digit: **parebici** = 1283
- **pi** = decimal point; **fi'u** = fraction; **ni'u/ma'u** = sign
- Fuzzy quantities: **ji'i** (approx), **za'u** (more than), **me'i** (less than), **du'e** (too many)

Ordinals/cardinals/fractions:

- **pamoi, remoi** = 1st, 2nd; **pa mei** = group of one
- **pimu si'e** = half-portion; **pimu cu'o** = 50% probability; **ci va'e** = level-3

Math (mekso):

- **li** = introduces a number/expression as *sumti*
- Logical connectives inside mekso: **eks** between operands, **jek**s between operators (Ch.8); **lo'o** closes **li** before an outer **.ije** (etc.)
- **me'o** = introduces a numeral as a symbolic label (not evaluated)

Summary

- **su'i, vu'u, pi'i, fe'i, te'a** = +, −, ×, ÷, ^
- **ne'o** = factorial; **de'o** = log; **ge'a** = absolute value; **gei** = scientific notation
- **jo'i … te'u** = vector; **pi'a** / **sa'i** = matrix from row / column vectors
- **vei … ve'o** = mekso parentheses
- **bi'e** = precedence bump on an infix **VUhU** (multiply-before-add style); default infix is **left-to-right**, not PEMDAS — see **bi'e** under *Operator Order*
- **boi** = operand separator
- **du** = mathematical equals; **xi** = subscript
- **na'u** / **nu'a** = operator ↔ *selbri* (inverse *cmavo* pair); **ni'e** = *selbri* ⟶ operand; **mo'e** = *sumti* ⟶ operand
- **mai** / **mo'o** = outline labels (*firstly*, big section numbers); see **mai** / **mo'o** under *Mekso: vectors…*; discourse detail in Chapter 17
- **ti'o** = planned precedence declarations for future parsers — meanwhile use **vei/ve'o**, **bi'e**, or forethought; default infix is left-to-right, not PEMDAS
- Indefinite **PA**: **so'a** … **so'u** (ordered fuzzy sizes); **pi**-forms for fractions of masses; **roi** after digits = tense, not math (Ch.9)
- **pe'o** = forethought (Polish) notation: operator comes first
- **fu'a** = reverse Polish (postfix) notation: operator comes last
- **ju'u** = base specifier for non-decimal numbers

Chapter 19. Phonology Deep Dive

The Lojban Sound System

Lojban was designed to be pronounceable by speakers of all major world languages. Its phonology is conservative: only sounds that appear across many different language families were chosen.

If English is your first language

Spelling and sound line up, but **English habits** mislead unless you override them:

Letter(s)	Not English …	Lojban target
c	*cake*, *cello*	/ʃ/ as in *shoe*
j	*judge*, *jar*	/ʒ/ as in *measure*, French *jour*
x	*exit*, *box*	/x/ as in *loch*, German *Bach*
g	*gem*	always /g/ as in *go*
y	*yes*, *happy*	only /ə/ (schwa) or non-stress buffer — never /j/

Diphthongs (**ai ei oi au**) are **one syllable** each — a glide ending toward /j/ or /w/, not two separate vowel letters in speech. Rough parallels: *k**igh**t*, *d**ay***, *b**oy***, *c**ow*** (accents differ; aim for a single moving vowel, not "ah-ee" as two beats).

Punctuation is phonemic: . marks a real **pause** (often glottal stop) before a vowel-initial word; **,** inside a word only disambiguates syllables (Special Characters below). There are no "silent letters" in ordinary Lojban words.

If English is your first language

Vowels

Lojban has six vowels:

Letter	IPA	Description
a	/a/	Low open vowel — like Spanish *a*, English *f**a**ther*
e	/ɛ/	Mid front — like English *b**e**d*
i	/i/	High front — like Spanish *i*, English *mach**i**ne*
o	/o/	Mid back rounded — like Spanish *o*, not English *hot*
u	/u/	High back rounded — like Spanish *u*, English *r**u**le*
y	/ə/	Schwa — like English ***a**bout*; neutral filler vowel

y is special: it's the "buffer vowel" used in *lujvo* and to resolve consonant clusters. It never carries stress, cannot start a word, and doesn't count when determining consonant clusters in morphology.

Consonants

Letter	IPA	Notes
b	/b/	voiced bilabial stop
c	/ʃ/	like English ***sh**oe*
d	/d/	voiced dental/alveolar stop
f	/f/	voiceless labiodental
g	/g/	voiced velar stop (always hard, never soft)
j	/ʒ/	like French ***j**our*, English mea_**s**ure_
k	/k/	voiceless velar stop
l	/l/	lateral, syllabic when between consonants
m	/m/	bilabial nasal, syllabic when between consonants
n	/n/	dental nasal, syllabic when between consonants
p	/p/	voiceless bilabial stop
r	/r/	rhotic — any r-sound acceptable (rolled, flapped, etc.)
s	/s/	voiceless alveolar sibilant
t	/t/	voiceless dental/alveolar stop
v	/v/	voiced labiodental
x	/x/	voiceless velar fricative — like German *Ba**ch***, Scottish *lo**ch***
z	/z/	voiced alveolar sibilant

Key pronunciation notes:

- **c** = /ʃ/ (English *sh*) — never /k/ or /s/
- **j** = /ʒ/ — the middle sound of *measure*
- **x** = /x/ — the back-of-throat sound, not /ks/ or /gz/
- **g** = always hard /g/ — never /dʒ/ as in English *gem*

Voiced / Unvoiced Pairs

Lojban consonants come in voiced/unvoiced pairs:

Voiced	Unvoiced
b	p
d	t
g	k
v	f
z	s
j	c

This pairing matters for consonant cluster rules: a voiced consonant cannot be directly adjacent to an unvoiced one (with a few exceptions: **sf**, **zv**, **jv**, **lv**, etc.) without a separating vowel.

Special Characters

Apostrophe (') — represents /h/ (a voiceless glottal fricative, like English *h*). It always appears between vowels and creates a brief breathing gap:

> **ta'a** = /ta'ha/ (roughly) — two syllables with h between **ki'a** = /ki'ha/ — exclamation of puzzlement

The apostrophe is *required* in writing wherever this /h/ sound appears. You cannot omit it.

Period (.) — represents a full stop or pause. Required before any word beginning with a vowel:

> **.abu** (the letter a) — pause before the vowel **.i** — sentence separator: pause then /i/ **la .alis.** — pause before and after the name Alice

The period is a genuine phonological element — a glottal stop or short silence. In careful speech, every word-initial vowel is preceded by a pause.

Comma (,) — used only within words to mark a syllable break that might otherwise be ambiguous. It has no pronunciation; it is a written-only aid to parsing:

> **.ei,u** — two separate vowels (not the diphthong
>
> *ei*
>
> 1.
>
> *u*
>
>), or to mark that **ei** and **u** are in separate syllables

Diphthongs

A diphthong is a two-vowel sequence pronounced as a single syllable (no separating consonant or apostrophe):

Four true diphthongs (falling — the first vowel is more prominent):

- **ai** /aj/ — like English *k**ite***
- **ei** /ej/ — like English *d**ay***
- **oi** /oj/ — like English *b**oy***
- **au** /aw/ — like English *c**ow***

These are used in attitudinals (**.ui .oi .ai .ei**) and *cmavo*.

Vowel pairs with apostrophe are *not* diphthongs — the /h/ separates them into two syllables:

> **u'i** = /uhi/ — two syllables, not a diphthong

Stress Rules

Lojban stress is **penultimate** (second-to-last syllable) for all *brivla*, and **conventional** (usually first syllable) for *cmavo*:

For *brivla*:

> **KLA-ma** (klama) **PRE-nu** (prenu) **BLA-nu** (blanu) **mel-BI** — no, wrong: **MEL-bi** (melbi)

The stress always falls on the vowel of the *second-to-last* syllable. The **y** vowel and apostrophe are ignored when counting syllables for stress:

> **loj-BAN** — wrong **LOJ-ban** — correct (lojban has 2 syllables: loj-ban, stress on first = penultimate)

For *cmavo*:

- No mandatory stress; conventional stress is on the first vowel
- Two-syllable *cmavo* like **ki'a**, **ta'e**, **ca'o** stress the first vowel: **KI'a**, **TA'e**, **CA'o**

Syllabic Consonants

The consonants **l**, **m**, **n**, and **r** can be syllabic — that is, they can form a syllable nucleus when surrounded by consonants, replacing what would otherwise be an uncomfortable consonant cluster:

> **bridi** — the **r** is not syllabic (it has vowels on both sides) **ta'onai** — not syllabic **prali** — the **r** can be syllabic in some clusters

In standard pronunciation, when one of these consonants appears between two consonants with no vowel, it is pronounced with a faint schwa-like quality.

Consonant Clusters

Lojban allows consonant clusters, but only *permissible* pairs. The rules:

General permissibility test for any CC pair: A pair is permissible unless it:

- Contains two identical consonants (**pp**, **tt**, etc.)
- Mixes a voiced and unvoiced member of the same stop/fricative pair: **bd**, **pb**, **dt**, **td**, **gk**, **kg**, **vf**, **fv**, **zs**, **sz**, **jc**, **cj**
- Contains **cx** or **xc** (sibilant+velar fricative combinations)
- Contains **mz**, **nz**, **nm**, **mn** (nasal+sibilant combinations: only **ns** and **nz** are allowed)

Permissible initial clusters (full list):

Initial clusters are the stricter subset used at the *start* of a word or syllable (in *gismu*, *lujvo*, and fu'ivla). There are exactly 48 permissible initial pairs:

Sibilant-stop	Sibilant-other	Voiced stop+liquid	Voiceless stop+liquid	Other
sp	sf	bl	pl	vl
st	sm	br	pr	vr
sk	sn	dr	tr	mr
zb	sv	gl	kl	ml
zd		gr	kr	
zg		dj	tc	
zv				
jb				
jd				
jg				
jv				
cb				
cd				
cg				
cv				

The complete 48 (in alphabetical order): **bl, br, cf, ck, cl, cm, cn, cp, cr, ct, dj, dl, dm, dn, dr, dv, dz, fl, fr, gl, gn, gr, jb, jd, jg, jm, jv, kl, kr, ml, mr, pl, pr, sf, sk, sl, sm, sn, sp, sr, st, sv, tc, tr, ts, vl, vr, xl, xr, zb, zd, zg, zm, zn, zv**.

These are the only clusters that may *begin* a word or syllable. All other combinations require a vowel (usually **y**) inserted between them.

Vowel Pairs: Diphthongs vs. Apostrophe Pairs

Two adjacent vowels in Lojban are either a **diphthong** (one syllable) or a **VV pair** (two syllables, separated by apostrophe /h/):

Diphthongs — one syllable, no apostrophe:

Pair	IPA	English approximation
ai	/aj/	k**igh**t
ei	/ej/	d**ay**
oi	/oj/	b**oy**
au	/aw/	c**ow**

These four only occur in Lojban *cmavo* and attitudinals. Any other vowel combination in a native Lojban word requires an apostrophe to separate the syllables.

VV pairs with apostrophe — two syllables:

All other adjacent vowel combinations in native Lojban words must use an apostrophe:

- **u'i**, **a'i**, **o'e**, **i'e**, **e'a**, etc.
- The apostrophe represents /h/ between the vowels: **u'i** = /u.hi/

In names (cmene): vowel pairs without apostrophe are permitted when the source language has them. A comma may be used in writing to indicate that two vowels are in separate syllables without implying /h/ pronunciation: **.ei,u** = three separate sounds, no diphthong and no /h/.

Buffer Vowel Insertion

When Lojban requires a vowel to break up an impermissible consonant cluster (in *lujvo*, cmene, or fu'ivla), the buffer vowel **y** is used in most cases:

> **pante** + **tavla** → **patyta'a** (not **patta'a** —
>
> *tt*
>
> is illegal) **mudri** + **siclu** → **mudysiclu**

The choice of buffer:

- **y** (schwa): standard in *lujvo*; it is morphologically transparent and doesn't carry stress
- **i** or **u**: used in names when **y** would feel unnatural or when the source language vowel is closer

In names, the buffer vowel is chosen to match the source phonology as closely as possible. The key rule is simply: every consonant pair in the result must be permissible.

Syllabication Algorithm

To determine where syllable breaks fall — which determines stress — Lojban uses a greedy algorithm:

1. Start from the left.
2. At each point between two consonants in a VC_1C_2V sequence: if C_1C_2 is a permissible *initial* cluster, the break is **before** C_1 (both consonants go to the next syllable: V | C_1C_2V).
3. If C_1C_2 is *not* a permissible initial cluster, the break is **between** C_1 and C_2 (VC_1 | C_2V).

Example: **ta-vla** — *vl* is a permissible initial pair ⟶ break before *v* ⟶ /tav.la/ — oops, that gives *vl* at the start of the second syllable which is correct: **tav-la** ⟶ stress on first syllable *tav*.

Example: **mlatu** — *ml* is a permissible initial pair ⟶ no break before *ml*, so: **mla-tu** ⟶ stress on *mla*.

Example: **bridi** — *br* is a permissible initial ⟶ **bri-di** ⟶ stress on *bri*.

Example: **lojban** — *jb* is a permissible initial ⟶ **loj-ban** ⟶ only 2 syllables ⟶ stress on first = **LOJ-ban**.

This algorithm determines which syllable is penultimate, which always receives stress in *brivla*.

Audio-Visual Isomorphism

Lojban is designed to be "audio-visual isomorphic" — what you write is exactly what you say, and vice versa. There is no silent letters, no irregular spelling, no homophone confusion. Every spoken Lojban sentence can be transcribed into written Lojban and back without any ambiguity.

This is why:

- The apostrophe (for /h/) must be written every time it's pronounced
- The period (pause) must be written before vowel-initial words
- Stress is regular and predictable — never needs marking

Allophones and Variation

Lojban phonology specifies *phoneme targets* but allows considerable phonetic variation:

- **r** can be any r-sound: trilled /r/, flapped /ɾ/, retroflex /ɻ/, approximant /ɹ/
- **n** before **k**/**g** can be /ŋ/ (as in English *si**ng***)
- Vowels may be somewhat lax in unstressed syllables
- **l** can be clear or dark

The key is that each sound must be distinguishable from all others. Lojban does not require "perfect" pronunciation — only distinct pronunciation.

Summary

- **English-first learners:** see **If English is your first language — c/j/x/g/y**, diphthongs as one syllable, **.** = pause

Summary

Feature	Value
Vowels	a e i o u y (6)
Consonants	b c d f g j k l m n p r s t v x z (17)
Special chars	' (apostrophe = /h/), . (period = pause)
Diphthongs	ai, ei, oi, au
Stress	Penultimate for *brivla*; first vowel for *cmavo*
c	= /ʃ/ (sh) — not /k/ or /s/
j	= /ʒ/ (zh) — not /dʒ/
x	= /x/ (kh) — not /ks/
g	= always /g/ — never soft
Syllabic consonants	l, m, n, r (between consonants)

Chapter 20. selma'o Catalogue

A **selma'o** is a grammatical word-class in Lojban — a group of *cmavo* that share the same grammatical behavior. Knowing a *cmavo*'s selma'o tells you exactly where it can appear in a sentence. This chapter provides a reference catalogue of all major selma'o with their key members and functions.

A — Sumti Logical Connectives (eks)

Connects two *sumti* logically. Used between *sumti* in afterthought position.

cmavo	Meaning
.a	or (A)
.e	and (E)
.o	iff (O)
.u	whether-or-not (U)
.a nai	not-or
.e nai	but not

> **mi .e do klama** — I and you go.

BAI — Modal Tags

Pre-built modal/case tags. Attach to *selbri* as tense-like tags. See Chapter 10.

Key members: **mu'i** (motivated by), **ki'u** (justified by), **ri'a** (physical cause), **ni'i** (logical entailment), **sepi'o** (using tool), **bai** (compelled by), **gau** (agent), **fi'o** (custom modal — followed by any *selbri*).

BE / BEI / BEhO — Inner Slot Fillers

Used inside descriptions to fill numbered places of the *selbri*.

cmavo	Role
be	fills x_2 of the description *selbri*
bei	fills x_3, x_4, … (successive places)
be'o	closes the be/bei construction

> **le dunda be le rozgu bei mi** — the giver of the rose to me.

BO — Closest Scope Grouper

bo right-groups two adjacent elements (*tanru* components, sentences, *sumti*).

> **mi .e do bo mi'o klama** — I, and (you-and-I), go. (grouping with bo)

BY — Letter Names

The selma'o containing all lerfu names: **.abu .ebu .ibu .obu .ubu ybu by. cy. dy.** … etc. See Chapter 18.

CAhA — Actuality/Potentiality

Marks whether a *bridi* is actual, potential, or a general law.

cmavo	Meaning
ca'a	actually is (in fact)
ka'e	is potentially capable of
nu'o	has never yet (unfulfilled potential)
pu'i	can and has (fulfilled potential)

> **mi ka'e limna** — I am capable of swimming (but maybe haven't). **mi pu'i limna** — I can swim and have done so.

COI — Vocative Markers

Used to address people or open communications.

cmavo	Meaning
coi	hello / greetings
co'o	goodbye
ju'i	attention!
nu'e	I promise
be'e	request to communicate
mi'e	I am [name]
doi	O [vocative marker] — direct address
ki'e	thank you
fi'i	welcome
je'e	Roger / understood
vi'o	wilco / acknowledged + will comply

> **coi .djan. doi .alis.** — Hello John, [addressing] Alice.

CUhE — Tense/Modal Question

cu'e asks "what tense/modal applies?":

> **cu'e do klama** — When/how are you going?

DAhO — Assignment Canceller

da'o cancels all current pronoun assignments (ko'a, ko'e, broda, etc.) without a topic change.

DOI — Vocative Marker

doi introduces a direct address (vocative). May optionally precede the name; also used alone to re-address.

> **doi .alis. klama** — Alice, go!

FA — Place Tags

Tags for explicitly marking *sumti* places. Used when reordering arguments.

cmavo	Place
fa	x_1
fe	x_2
fi	x_3
fo	x_4
fu	x_5
fi'a	place question (which place?)

> **klama fa mi fe le zarci** — go, x_1=I, x_2=the store.

GA — Forethought Logical Connectives (geks)

Forethought connectives that precede both sentences; **gi** separates them.

cmavo	Meaning
ga	either…or
ge	both…and
go	whether…or (iff)
gu	whether or not
ge'i	connective question

ge mi klama gi do cadzu — Both I go and you walk.

GAhO — Interval Boundary Markers

Modifies interval expressions to indicate open/closed boundaries:

cmavo	Meaning
ga'o	closed boundary (includes endpoint)
ke'i	open boundary (excludes endpoint)

mi cadzu ga'o le zarci ke'i le briju — I walk from the store (inclusive) to the office (exclusive).

GIhA — Bridi-Tail Connectives (giheks)

Connects two *bridi*-tails sharing the same x_1.

cmavo	Meaning
gi'e	and
gi'a	or
gi'o	iff
gi'u	whether or not
gi'i	connective question

mi citka gi'e pinxe — I eat and drink.

GOI — Relative Phrase Markers

Introduces relative phrases (possessives and identifiers). See Chapter 11.

cmavo	Meaning
pe	restrictive association
po	restrictive possession (alienable)
po'e	restrictive possession (inalienable)
po'u	restrictive identity
ne	incidental association
no'u	incidental identity

GOhA — Pro-*bridi*

Anaphoric references to previous *bridi*. See Chapter 5.

cmavo	Meaning
go'i	previous *bridi* (full echo)
go'a	earlier mentioned *bridi*
go'e	second most recent *bridi*
go'u	some further back *bridi*
mo	*bridi* question
nei	this *bridi* (recursion, reflexives; often **le nei**, **le nu le nei**)
no'a	outer *bridi* (in abstraction)

GUhA — Forethought Selbri Connectives (guheks)

Forethought connectives inside *tanru*/*selbri*:

cmavo	Meaning
gu'e	both
gu'a	or
gu'o	iff
gu'u	whether or not
gu'i	question

> **gu'e blanu gi xunre gerku** — a both-blue-and-red dog.

I — Sentence Separator

.i separates sentences. Can be compounded with connectives and modals:

> **.i** — new sentence (same topic) **.ije** — and (next sentence) **.ibo** — closely related next sentence **ni'o** — new paragraph/topic (selma'o NIhO)

JA — Tanru/Selbri Connectives (jeks)

Logical connectives used within *tanru* or between *selbri*:

cmavo	Meaning
je	and
ja	or
jo	iff
ju	whether or not
je'i	question

> **barda je blanu** — big and blue.

JOI — Non-Logical Connectives (joiks)

Non-logical connectives for masses, sets, sequences, alternation:

cmavo	Meaning
joi	mixed mass (inseparable mixture)
ce	set member (forms a set)
ce'o	sequence member (ordered)
fa'u	and-respectively
jo'e	union
ku'a	intersection
pi'u	cross product

> **mi joi do** — me-and-you as a single mass. **la .alis. ce la .djan.** — the set {Alice, John}.

KE / KEhE — Tanru Grouping

ke opens a grouping in *tanru*; **ke'e** closes it (elidable at end of *selbri*). Also used for scalar negation scope: **na'e ke … ke'e**.

KEI — Abstraction Terminator

kei closes all NU abstractions. Elidable at end of *bridi* or before **cu**.

KOhA — Pro-*sumti*

The large class of *sumti*-replacing *cmavo*. See Chapter 5.

Subgroups:

- **mi-series**: mi, do, mi'o, ma'a, mi'a, do'o, ko
- **ti-series**: ti, ta, tu
- **di'u-series**: di'u, di'e, dei, do'i
- **ko'a-series**: ko'a–ko'u (assignable with goi)
- **ri-series**: ri, ra, ru (anaphoric)
- **vo'a-series**: vo'a–vo'e (reflexive)
- **da-series**: da, de, di (logical variables)
- Special: **zo'e** (unspecified), **zu'i** (typical), **ce'u** (lambda), **ma** (question), **ke'a** (relative clause)

LE — Description Operators

All the gadri (article-like words) that build *sumti* from *selbri*. See Chapter 3.

cmavo	Meaning
le	specific description (speaker's framing)
lo	generic description (objectively)
la	name description
lei / loi / lai	mass descriptors
le'i / lo'i / la'i	set descriptors
le'e / lo'e	stereotypical/typical

NA — Bridi Negation

cmavo	Meaning
na	*bridi* negation (false)
ja'a	*bridi* affirmation (explicit true)

NAhE — Scalar Negation

cmavo	Meaning
na'e	other than
no'e	midpoint / neutral
to'e	polar opposite
je'a	indeed (scalar affirmation)

NIhO — Paragraph Markers

cmavo	Meaning
ni'o	new topic / paragraph
no'i	resume previous topic

NU — Abstractors

All NU *cmavo* package a *bridi* as an abstraction *sumti*. See Chapter 12.

cmavo	Type
nu	event (general)
mu'e	point-event
pu'u	process
zu'o	activity
za'i	state
ka	property
ni	amount
du'u	proposition
jei	truth value
si'o	concept/idea
su'u	abstraction (generic)

PU — Tense (Temporal Direction)

cmavo	Meaning
pu	past
ca	present
ba	future

SE — Place Conversion

cmavo	Meaning
se	swap $x_1 \leftrightarrow x_2$
te	swap $x_1 \leftrightarrow x_3$
ve	swap $x_1 \leftrightarrow x_4$
xe	swap $x_1 \leftrightarrow x_5$

UI — Attitudinals and Discursives

The large class of free-modifier particles expressing emotion, attitude, evidential stance, and discourse structure. See Chapter 7.

Key members: **.ui** (happy), **.oi** (pain), **.au** (desire), **.ai** (intent), **.ei** (obligation), **pe'i** (I opine), **ti'e** (reportedly), **ka'u** (I know by experience), **ru'a** (I postulate), **ju'a** (I assert), **pau** (question marker), **pei** (attitude question), **dai** (empathy), **fu'i** (easy), **bi'u** (new information), **si'a** (similarly).

VA — Spatial Distance

cmavo	Meaning
vi	near here
va	at medium distance
vu	far away

ZAhO — Aspect (Event Contour)

See Chapter 16 for full table. Key members: **pu'o** (about to), **co'a** (starts), **ca'o** (ongoing), **co'u** (stops), **mo'u** (completes), **za'o** (too long), **ba'o** (resultant state), **co'i** (whole event).

ZI — Temporal Distance

cmavo	Meaning
zi	short time ago/hence
za	medium time
zu	long time

ZOI — Foreign Quote

zoi introduces a foreign-text quotation using delimiter words. **la'o** does the same but creates a name *sumti*. See Chapter 17.

ZOhU — Topic/Comment Separator

zo'u separates the topic (or prenex) from the comment *bridi*. See Chapter 17.

Alphabetical supplement — more selma'o (short index)

The subsections above are grouped by **topic**. The table below lists additional common **selma'o** in alphabetical order with a one-line role and a pointer to where this book treats them (or to the chapter that uses them most). Use it when you meet a *cmavo* in the wild and want a quick label.

Selma'o	Role (one line)	Where in this book
BAI	Brivla-as-modal: a *brivla*'s meaning packaged as a modal tag (`se`+BAI, `fi'o`, …).	Ch.10
BAhE	Emphasis / "nonce" marker on the next word.	Ch.17
BE	Links *sumti* into a *tanru* (`be … bei … be'o`).	Ch.15
BIhE	Mekso: prefix **bi'e** on a **VUhU** operator so it binds before unmarked neighbors (alternative to **vei … ve'o**); default infix is left-to-right.	Ch.18
BIhI	Logical interval connectives between *sumti*.	Ch.8
BOI	Terminates a string of lerfu / digit / hyphen in mekso.	Ch.18
BU	Turns almost any word into a "letter" *sumti*.	Ch.18
CAI	Attitudinal intensity (cai / cu'i / …).	Ch.7
CEI	Assigns a *selbri* to a **pro-bridi** (`broda … brodu`).	Ch.5
CEhE	Joins terms into a **termset** (`ce'e`).	Ch.8
CO	Tanru inversion: `A co B` ≈ `B A`.	Ch.15
CU	Separates **sumti** from **selbri** (often elidable).	Ch.2
DOhU	Ends a **vocative** phrase.	Ch.17
FAhA	Spatial direction tag (`fa'a`, `zu'a`, …).	Ch.9
FAhO	End-of-text marker.	Ch.17
FEhE	Modifies spatial extent (`fe'e`).	Ch.9
FEhU	Ends an ad-hoc modal phrase (`fi'o … fe'u`).	Ch.10
FIhO	Introduces an ad-hoc modal (`fi'o`).	Ch.10
FOI	Ends a `tei … foi` compound letteral.	Ch.18
FUhA	Mekso: reverse Polish (operand stack) intro.	Ch.18
FUhE / FUhO	Mekso: open/close long-scope operators.	Ch.18
GEhU	Ends a **ghek** (logical connective skeleton).	Ch.8
GI	Separates connected *bridi* within **jek / joik / gek** patterns.	Ch.8
JAI	Extracts a modal/tense place or reshapes the *bridi* (`jai`).	Ch.10, Ch.15
JOhI	Vector "comma" `jo'i` in mekso.	Ch.18
KI	"Sticky" tense (anchors a series of sentences).	Ch.9
KU	Ends **LE/LA** *sumti*; ends bare tense/modal; part of **na ku**.	Ch.3, Ch.9, Ch.13
KUhE	Ends **forethought** mekso (`pe'o … ku'e`).	Ch.18
KUhO	Ends a relative clause (`poi … ku'o`).	Ch.11

The alphabetical supplement above and the topic table earlier in this chapter cover all *selma'o* a learner will encounter. Rarer classes and specialist examples are addressed where their *cmavo* are introduced throughout this book.

Beyond this catalogue

This chapter covers all *selma'o* a learner needs, organised by topic (earlier tables) and alphabetically (the supplement above).

– ***cmavo* lookup by class:** jbovlaste lists every *cmavo* with *rafsi* and official gloss.

- **Formal grammar:** Chapter 21 of this book gives a prose overview of the formal rules; parser tools are linked there.

Chapter 21. Formal Grammar

What Is the Formal Grammar?

Lojban's grammar is defined by a formal **EBNF (Extended Backus-Naur Form)** grammar — a precise mathematical specification of every legal sentence. This is what makes Lojban genuinely unambiguous: there is exactly one parse tree for every grammatical Lojban expression.

This chapter summarizes the key structural rules in reader-friendly terms. It does **not** duplicate the full **EBNF** rules or selma'o cross-reference tables line-for-line.

Where the machine grammar lives

The complete formal grammar of Lojban is specified as an **EBNF (PEG)** machine grammar. You do not need to read it to speak Lojban, but knowing it exists explains why "the parser says no" can have a definitive answer.

Key resources for the formal grammar:

- **Parser tools:** camxes, ilmentufa, and other community parsers accept a Lojban string and return its parse tree or an error — the fastest way to check a tricky sentence.
- ***cmavo* by selma'o:** Chapter 20 of this book catalogues every selma'o with examples; jbovlaste lists individual *cmavo*.
- **Abbreviated EBNF for key rules** — the table below gives the handful of non-terminals that most affect learners.

Rule	What it generates	Key *cmavo* classes
`text`	A full Lojban utterance	`I`, `NIhO`, `NO'I`
`sentence`	One *bridi* or question	`I` (sentence separator)
`bridi_tail`	*selbri* + trailing *sumti*	`CU`, `VAU`
`selbri`	The predicate (may be a *tanru*)	`CO`, `KE`/`KEhE`
`sumti`	Any argument	`LE`, `LA`, `LO`, `KOhA`, `ZO`, `ZOI`
`tag`	Tense or modal prefix	`PU`, `ZI`, `ZEhA`, `FAhA`, `BAI`
`relative_clause`	`poi`/`noi` + _bridi_tail	`GOI`, `NOI`
`prenex`	Bound variables before *bridi*	`DA`, `GOhA` + `ZO'U`
`abstraction`	Abstractor + _bridi_tail + `kei`	`NU` + `KEI`
`number`	Any numeric string	`PA`, `MAI`, `MOI`, `ROI`

Using this friendly chapter: treat these sections as a **conceptual map** (templates, scope, elision). If a parser rejects a sentence, check the **formal** chapter and your parser's documented baseline — community grammars evolve; the friendly text may simplify or reorder explanations for teaching.

The Hierarchy of Lojban Structure

Lojban utterances are built up through nested layers:

```
text
 └── paragraphs (ni'o / no'i groups)
      └── sentences (.i separated)
           └── _bridi_
                ├── prenex (... zo'u)
                ├── _sumti_ (arguments)
                └── _selbri_ (predicate)
                     ├── _brivla_ (single word)
                     ├── _tanru_ (_brivla_ sequence)
                     └── abstraction (NU + _bridi_ + kei)
```

Each level can contain connectives, tense tags, attitudinals, and terminators.

The Core Bridi Template

A canonical *bridi* has this structure:

```
[prenex zo'u] [_sumti_...] [tense] [NA] _selbri_ [_sumti_...] [vau]
```

More precisely:

```
[topic zo'u] [FA-tag] _sumti_ [cu] [tense/modal] [na] _selbri_ [_sumti_...] [vau]
```

cu separates the pre-*selbri sumti* from the *selbri* itself and is required when the *sumti* might otherwise be parsed as part of a *tanru*.

vau closes the *bridi* (almost always elidable, but terminates any implicit open *bridi*).

Sumti

A *sumti* is any of:

Form	Description
le/lo/la … ku	description with gadri
li …	mathematical expression
lu … li'u	Lojban quotation
zo word	single-word quotation
zoi X … X	foreign text quotation
la'o X … X	foreign name
pronoun	mi, do, ti, ko'a, da, ke'a, ce'u, zo'e, etc.
name	**la** + *cmevla*
abstraction	**le NU *bridi* kei**

Sumti can be followed by relative clauses (**poi/noi … ku'o**), relative phrases (**pe/po/ne** + *sumti*), or **be/bei/be'o** inner-slot fillers when embedded in a description.

Selbri

A *selbri* is any of:

Form	Description
single *brivla*	**klama**, **blanu**, **mamta**
tanru	two or more *brivla*, optionally with **bo**, **ke…ke'e**, **je**, **co**
NU *bridi* kei	abstraction as *selbri*
me *sumti* me'u	*sumti* converted to *selbri*
go'i (and other GOhA)	pro-*selbri*
na'e/no'e/to'e + *selbri*	scalar negation prefix

The **co** operator inverts the *tanru* so the post-**co** word is the modifier and the pre-**co** word is the head:

```
A co B  =  B-type A  (B modifies A)
```

Selbri

Tense Structure

Tense is a **prefix** on the *selbri* (before **na** and the *selbri* itself):

```
[PU] [ZI] [FAhA] [VA] [ZAhO] [CAhA]  _selbri_
```

Each component is optional and they stack left-to-right, each adding a leg of the "imaginary journey":

- **PU** = temporal direction (pu/ca/ba)
- **ZI** = temporal distance (zi/za/zu)
- **FAhA** = spatial direction (zu'a, ri'u, etc.)
- **VA** = spatial distance (vi/va/vu)
- **ZAhO** = aspect (co'a, ca'o, co'u, etc.)
- **CAhA** = actuality/potentiality (ca'a, ka'e, etc.)

A tense may be followed by **ki** to set it as a persistent reference point for subsequent sentences.

Logical Connective Forms

Lojban has six *positions* where logical connectives appear, each with its own *cmavo* class:

Position	Class	Example
Between sentences	I + JA	**.ije**, **.ija**
Between *bridi*-tails (shared x_1)	GIhA	**gi'e**, **gi'a**
Between *sumti*	A	**.e**, **.a**
Between *tanru* components	JA	**je**, **ja**
Forethought (before both *bridi*)	GA + gi	**ge...gi**, **ganai...gi**
Forethought (inside *selbri*)	GUhA + gi	**gu'e...gi**

All connectives follow the same four-vowel system (A/E/O/U) encoding the same truth functions regardless of position.

Terminator Elision Rules

Lojban has many optional terminators. The general rule: **a terminator can be elided when the next word unambiguously signals the end of the current construction**.

Key terminators and their elision conditions:

Terminator	Closes	Safe to elide when…
ku	LE/LA description	next word is a *selbri*, another *sumti* starter, or end-of-*bridi* signal
kei	NU abstraction	next is **cu**, a tense, or end-of-*bridi*
vau	*bridi*	almost always (**.i** or **fa'o** next)
ku'o	poi/noi clause	next is not another word that could extend the clause
ge'u	GOI phrase	next is not another *sumti* modifier
ke'e	ke grouping	at the end of the *tanru*/*selbri*
be'o	be/bei chain	not followed by a relative clause (**poi/noi**)
li'u	lu quotation	usually kept for clarity
lo'o	loi/lei mass description	usually safe
tu'u	tu'e block	at the actual end of the block
me'u	me construction	usually safe
kei	tense/tag NU	before **ku** or **.i**

When elision is *unsafe* (keep the terminator):

1. **Ambiguity with following word:**

> **le gerku poi blabi ku'o cu barda** → safe to elide **ku'o le gerku poi blabi cu barda** = same meaning (cu ends the poi clause unambiguously)

But:

> **le gerku poi le nanmu pu viska** — does this end after **viska**? Or does more follow? **le gerku poi le nanmu pu viska ku'o cu batci** — explicit **ku'o** needed here because **cu** is far away

2. **be/bei before a relative clause:**

> **le dunda be le rozgu poi melbi** — ambiguous: does **poi** attach to **le rozgu** or to the whole **dunda be le rozgu**? **le dunda be le rozgu be'o poi melbi** — clear: **poi** attaches to the whole dunda-construction

3. **Nested abstractions:**

> **le du'u le nu mi klama kei cu vajni** — **kei** needed to close the inner **nu** before the outer

bridi

> continues

4. **Stacking *sumti* without clear boundary:**

> **mi djuno le du'u do klama le zarci** — the LE stacks are closed by context **mi djuno le du'u do klama le zarci ku kei** — explicit if the outer
>
> *bridi*
>
> continues with more
>
> *sumti*

The elision hierarchy (informal rule of thumb):

Terminators lower in this list are *more* commonly elided than those above them:

1. **li'u** — least often elided (keeps quotes clearly bounded)
2. **be'o** — elide only at end of description
3. **ku'o** — elide when **cu** or **.i** follows
4. **kei** — elide when **cu** follows
5. **ku** — usually safe to elide
6. **vau** — almost always safe

The parser is greedy: it absorbs as much as it can into the current construction. So **ku**, **kei**, and **ku'o** tell the parser "stop here" — without them, the parser keeps extending.

Free Modifiers (Free Grammar)

Many constructs can appear *almost anywhere* in a sentence without changing the parse. These have "free grammar" — they attach to whatever is nearest them:

- **Attitudinals** (UI): **.ui**, **.oi**, **pe'i**, **ti'e**, etc.
- **Discursives** (UI): **ku'i** (however), **ta'o** (incidentally), **mi'u** (ditto)
- **to … toi**: parenthetical remarks
- **sei … se'u**: metalinguistic commentary
- **xi**: subscript

Free modifiers do not change the syntactic parse; they only add pragmatic/attitudinal color.

Prenex and Quantifier Logic

zo'u and the Prenex

zo'u is the grammatical separator between a **prenex** and the **bridi body**. Its grammar role is unambiguous: everything before **zo'u** is the prenex (a sequence of quantified *sumti*), everything after is the *bridi*.

```
ro da poi prenu zo'u da morsi
| ← prenex ——————————| — _bridi_ —┤
"For all X that are persons: X dies."
```

The prenex binds **logical variables** (da, de, di, and their subscripted variants) with quantifiers. The variables then appear in the *bridi* body where they are used.

Why zo'u exists (grammar perspective)

Without **zo'u**, a quantifier phrase like **ro da poi prenu** would be parsed as a *sumti* — just an argument filling a numbered place. There would be no structural way to indicate it binds the whole following *bridi*.

zo'u signals: "I am done listing the variables; everything that follows is the scope of those bindings." This is the Lojban equivalent of the mathematical ∀x (…) or ∃x (…) notation — **zo'u** is the opening parenthesis and the end of the *bridi* is the close.

Quantifier Types

Prenex form	Logical meaning	English
da alone	∃x (there exists x)	something
su'o da	∃x (at least one)	at least one thing
ro da	∀x (for all x)	everything
da poi [clause]	∃x: clause	something that is…
ro da poi [clause]	∀x: clause ⟶ …	everything that is…

> **da zo'u da klama** = ∃x: x goes = Something goes. **ro da poi prenu zo'u da morsi** = ∀x: person(x) ⟶ dies(x) = All persons die. **su'o da poi gerku zo'u da blabi** = ∃x: dog(x) ∧ white(x) = Some dog is white.

Scope Order

The order of variables in the prenex determines scope. The leftmost variable has the widest scope (is the outermost quantifier):

> **ro da su'o de zo'u da dunda de mi** = ∀x ∃y: x gives y to me = Everyone gives me something (possibly different things).

> **su'o de ro da zo'u da dunda de mi** = ∃y ∀x: x gives y to me = There is one thing that everyone gives me (the same thing).

These have *different meanings* despite using the same words. Only the prenex order distinguishes them.

Inner Quantifiers vs. Prenex

Quantifiers can also appear *without* a prenex, directly inside descriptions:

> **ro le prenu cu morsi** = All the persons die. (inner quantifier on le)
> **su'o lo gerku cu blabi** = Some dog is white. (inner quantifier on lo)

These are equivalent to prenex quantifiers for most purposes, but the *scope* of inner quantifiers is limited to the *bridi* they appear in. They cannot extend across sentence boundaries.

Prenex variables (**da**, **de**, **di**) can extend across a whole discourse (until a **da'o** resets them). This is how Lojban expresses complex logical arguments:

> **da poi prenu zo'u da'e mlatu** = There is a person such that [in all possible worlds] that person is a cat. (da ranges across the modal)

da'o: Resetting Variables

da'o cancels all current pronoun and logical variable assignments, starting fresh. It is often placed after **ni'o** at major topic boundaries. Without **da'o**, a variable bound in one paragraph might unexpectedly still be bound in the next.

Useful Prenex Patterns

Universal negation:

> **ro da poi prenu zo'u da na morsi** = No person dies (literally: for all persons, they do not die).

Mutual relationship:

> **ro da ro de poi prenu zo'u ganai da prami de gi de prami da** = For all persons A and B: if A loves B then B loves A. (mutual love claim)

Existential within universal:

> **ro da poi prenu zo'u su'o de poi plise zo'u da citka de** = Every person eats some apple (they may eat different apples).

zo'u in topic-comment sentences: When **zo'u** appears with a non-variable *sumti* (like a description), it creates a *topic-comment* sentence rather than a logical prenex. The distinction is grammatical only in how the sentence is interpreted:

le finpe zo'u citka — The fish: [it/they] eat[s]. (topic-comment) **da poi finpe zo'u da citka** — For some fish: it eats. (logical prenex)

The Grammar as a Whole

Key properties of the formal Lojban grammar:

1. **Unambiguous**: every grammatical string has exactly one parse tree. No structural ambiguity.
2. **Context-free** (with some lexical lookups): the grammar can be parsed left-to-right with bounded lookahead.
3. **Regular morphology**: word-class (*cmavo* / *brivla* / cmene) is determinable from word shape alone, before parsing.
4. **Audio-visual isomorphism**: written form = spoken form with no exceptions.
5. **Elidable terminators**: formal grammar permits all terminators; spoken and written usage elides them when unambiguous.

Quick Reference: Sentence Building

A minimal grammatical Lojban *bridi* requires only a *selbri*:

klama —

Someone/something goes to somewhere from somewhere.

Add x_1:

mi klama

Add x_2:

mi klama le zarci

Add tense:

mi pu klama le zarci

Add negation:

mi pu na klama le zarci

Add relative clause on *sumti*:

mi pu klama le zarci poi barda

Add modal:

> **mi pu klama le zarci mu'i le nu mi djica**

Embed in abstraction:

> **le du'u mi pu klama le zarci cu vajni**
>
> *The proposition that I went to the store is important.*

Each layer is added according to the formal grammar — and at each step the result is unambiguous.

---

bu'a-series: Selbri Variables

Just as **da/de/di** are bound variable *sumti* (standing for unknown *things*), **bu'a/bu'e/bu'i** are bound variable *selbri* — they stand for unknown *predicates* or *relations*:

> **da bu'a** — Something stands in some relation. (existential claim about any relation)

> **ro da ro de zo'u ganai da bu'a de gi de bu'a da**
>
> *For all relations bu'a: if A bu'a B then B bu'a A.*
>
> (claim that all such relations are symmetric)

bu'a/bu'e/bu'i work exactly like da/de/di — they are bound by quantifiers in the prenex and appear in the *bridi* body. They fill the *selbri* slot:

> **su'o bu'a zo'u mi bu'a do**
>
> *There is some relation that holds between me and you.*

This is how Lojban makes claims about properties of properties — second-order logic. It's used in precise logical arguments and in formal definitions.

Prenex rule (CLL): You cannot write bare **bu'a zo'u ...** — the prenex must contain **sumti**, and **su'o bu'a** (or **ro bu'a**, etc.) counts as an **indefinite description** in that slot, just like **su'o nanmu**. If you drop the prenex, you drop the explicit **su'o** too:

> **la .djim. bu'a la .djan.**
>
> *Jim stands in at least one relation to John.*

(implicit **su'o**)

If the quantifier on **bu'a** is anything other than **su'o**, keep the prenex:

ro bu'a zo'u la .djim. bu'a la .djan.

For every relation F: Jim F John

— usually false; needs **ro bu'a** in the prenex.

bu'a vs **broda:** Chapter 5 uses **broda**, **brode**, … as informal "slot-filler" *brivla* in examples. For **bound** predicate variables in a prenex, use **bu'a**/**bu'e**/**bu'i** (selma'o GOhA), not **broda**.

A few more notes on variables

Subscripts: If you need more than three *sumti* variables or three *selbri* variables, add a **xi** subscript — **da xi vo**, **bu'a xi re** — each (*cmavo* + subscript) pair is a fresh binding (Chapter 18 for **xi** notation).

Requantifying the same variable: Later in the *bridi*, **ci da … re da …** can pick out a *subset* of the things **da** already ranged over (e.g. three cats white, two of *those* cats big). Full detail is textbook logic; just remember later numbers are *about* the same **da**, not a new unrelated **da**.

Where this chapter sits: CLL's logic chapter ends by noting that speakable predicate logic is **open-ended** — Lojban's grammar is fixed, but the hardest metalogic is still research. Here you have the **practical** core: prenexes, **naku** movement, connectives, **da** and **bu'a**, and De Morgan. Deeper proof theory is the same as in any logic text, only with Lojban surface forms.

De Morgan's Laws in Lojban

De Morgan's laws state that logical negation distributes over connectives, swapping AND↔OR:

not(A and B) = (not A) or (not B) not(A or B) = (not A) and (not B)

In Lojban, these translate directly:

For *sumti* connectives:

naku la .alis. .e la .djan. cu klama = la .alis. na klama .a la .djan. na klama

Not both Alice and John go

=

> *Alice doesn't go or John doesn't go.*

For *bridi* connectives:

> **na ku ge la .alis. cu klama gi la .djan. cu klama = la .alis. na klama .a la .djan. na klama**
>
> *It's not the case that both go*
>
> =
>
> *One of them doesn't go.*

The rule in connective vocabulary:

- Negating **E (and)** → **A (or)** with negated components: **naE** = nand
- Negating **A (or)** → **E (and)** with negated components: **naA** = nor

This is why the vowel+na+nai system covers all 16 truth functions — De Morgan lets you express every combination.

Quantifier De Morgan (covered in Chapter 13):

- **naku ro da** = **su'o da naku** — not-all = some-not
- **naku su'o da** = **ro da naku** — none = all-not

---

naku Outside a Prenex: Full Treatment

naku in a prenex position negates the scope of what follows with full quantifier interaction. Outside a prenex, it works as a "wide-scope na":

> **naku la .alis. cu klama**

This is equivalent to **la .alis. na klama** for simple *bridi* but differs with quantifiers:

> **naku ro le prenu cu morsi**
>
> *Not every person dies.*
>
> (= some person doesn't die — naku + ro = su'o na)

> **naku su'o le prenu cu morsi**
>
> *No person dies.*
>
> (= every person doesn't die — naku + su'o = ro na)

The full table:

	With naku	Without naku	Quantifier effect	
	naku ro da broda	**su'o da na broda**	not-all ⟶ some-not	
	naku su'o da broda	**ro da na broda**	none ⟶ all-not	
	naku no da broda	**su'o da broda**	not-zero ⟶ some	
	naku re da broda	complex	not-exactly-two	

naku is most important in logical arguments and in understanding the precise scope of negation. For ordinary speech, **na** before the *selbri* is usually sufficient.

Logic and Quantifiers

Existential Claims: da, de, di

The *cmavo* **da**, **de**, and **di** (selma'o KOhA) are logical *variables* — they stand for unknown things, like X, Y, and Z in logic notation.

The most basic use is an *existential claim*: asserting that something exists.

> **da viska mi**
>
> *There is an X such that X sees me.*
>
> ⟶
>
> *Something sees me.*

This does not presuppose that the listener knows what is doing the seeing — it only claims that something does.

A *prenex* makes the structure explicit. It consists of any number of variable declarations followed by **zo'u**:

> **da zo'u da viska mi**
>
> *There-is-an-X such-that: X sees me.*

The prenex can hold multiple variables:

> **da de zo'u da prami de**
>
> *There-is-an-X, there-is-a-Y: X loves Y.*

→

Somebody loves somebody.

Note: **da** and **de** can refer to the same thing unless that is explicitly ruled out. The sentence above does not mean "somebody loves somebody *else*."

da zo'u da prami da

Somebody loves themselves.

Universal Claims: ro da

When **ro** (all/every) precedes a variable, it makes a *universal claim*:

ro da zo'u da viska mi

For every X: X sees me.

→

Everything sees me.

Mixed universal and existential claims have crucially different meanings depending on order:

ro da de zo'u da viska de

For every X, there is a Y: X sees Y.

→

Everything sees something.

(each thing sees something, possibly different somethings)

da ro de zo'u da viska de

There is an X such that for every Y: X sees Y.

→

Something sees everything.

(one particular thing sees all)

These mean completely different things. The order of variables in the prenex determines scope: the leftmost has the widest scope.

Restricted Variables: da poi

Variables can be restricted to a subset using a **poi** relative clause:

> **da poi gerku cu vasxu**
>
> *There is an X which is a dog: X breathes.*
>
> →
>
> *Some dog breathes.*

> **ro da poi gerku cu vasxu**
>
> *For every X which is a dog: X breathes.*
>
> →
>
> *Every dog breathes.*

This is far more useful than unrestricted universal claims, which are almost never true about absolutely everything.

Dropping the Prenex

The prenex is optional when the variables appear in the **same order** in the main *bridi* as they did in the prenex. In that case, just move any **ro** and **poi** to the first occurrence of the variable:

> **da viska mi** —
>
> *Something sees me.*
>
> **ro da poi gerku cu vasxu** —
>
> *Every dog breathes.*

When variables need to appear in a *different* order than their scope order, you need the prenex explicitly. For example, to say "every person is bitten by some dog":

> **ro da poi prenu ku'o de poi gerku zo'u de batci da**

Dropping the prenex here and reversing the order would instead say "some dog bites every person" — a completely different claim.

Generalized Quantifiers

Any number can quantify a variable, not just **ro** (all) and **su'o** (at least one):

> **re da viska mi** —
>
> *Exactly two things see me.*
>
> **su'ore da viska mi** —
>
> *At least two things see me.*
>
> **no da viska mi** —
>
> *Nothing sees me.*
>
> (zero things see me)

Note: bare **da** without an explicit quantifier implies **su'o da** (at least one). So **da viska mi** means "at least one thing sees me."

The distinction between exact and minimum counts:

- **re** = exactly two
- **su'ore** = at least two (su'o = "at least", re = "two")

Quantifier Scope and Grouping

When two quantified expressions appear in the same *bridi* without a prenex, the *left-to-right order* determines scope:

> **ci gerku cu batci re nanmu**
>
> *Three dogs bite two men.*

Does each dog bite the same two men, or possibly different pairs? In Lojban, the left variable (**ci gerku**) has wider scope — so there are three dogs each biting two men, possibly different ones. Up to six different men could be involved.

To make both quantifiers have *equal scope* (the same two men bitten by all three dogs), use a **termset** with **ce'e**:

> **ci gerku ce'e re nanmu cu batci**
>
> *Three dogs [together with] two men bite.*
>
> (the same two men are bitten by all three dogs)

The Problem of "Any"

English "any" is ambiguous. Lojban treats the two senses differently:

Universal "any" (*anyone who does X also does Y*): use **ro da poi**:

> **ro da poi klama le zarci cu cadzu le foldi**
>
> *Everyone who goes to the store walks across the field.*

This asserts that there *are* people going to the store (universal claims imply the existential). If you want a purely *conditional* statement with no such implication, use the logical connective **go** (if-and-only-if):

> **ro da zo'u da go klama le zarci gi cadzu le foldi**
>
> *For every X: X goes to the store if and only if X walks across the field.*

This does not imply that anyone actually goes to the store.

Existential "any" (*I need any box* = I need a box, one will do): when the existence is inside a want/need/possibility context, bind the variable in the *inner* prenex:

> **mi nitcu lo nu da poi tanxe gi'e bramau ti zo'u mi ponse da**
>
> *I need an event of: there existing a box bigger than this that I own.*

The **da** is existential only within the **nu** abstraction — it doesn't assert the box exists in the real world right now, only in the needed event.

Negation Boundaries

When **naku** appears in a prenex, it creates a *negation boundary*. Moving **naku** past a quantifier **inverts** it: **ro** ↔ **su'o**.

Starting from:

> **ro da su'o de zo'u da prami de**
>
> *Everybody loves at least one thing.*

Negate it:

> **naku ro da su'o de zo'u da prami de**
>
> *It is false that everybody loves at least one thing.*

Moving **naku** rightward past **ro da** (inverting **ro** → **su'o**):

> **su'o da naku su'o de zo'u da prami de**
>
> *There is someone who doesn't love anything.*

Moving it one more step past **su'o de** (inverting **su'o** → **ro**):

> **su'o da ro de naku zo'u da prami de**
>
> *There is someone who, for each thing, doesn't love that thing.*

All three forms are logically equivalent. The rule: **every time naku crosses a quantifier boundary, invert the quantifier** (ro↔su'o). Double negatives in adjacent position cancel.

The quantifier **no** (zero) is shorthand for **naku su'o** — *none* means *not-at-least-one*. To negate a **noda** sentence, first expand it:

> **noda vasxu** = **naku su'o da vasxu** → negation = **su'o da vasxu** (
>
> *something breathes*
>
>)

Terminator Elision: Context Rules

The Lojban parser is **greedy** — it consumes as much as possible into the current construction before stopping. Terminators tell the parser where to stop. Knowing when elision is safe requires understanding what the parser would do without the terminator:

Always safe to elide (parser cannot be misled):

- **vau** at the end of a sentence before **.i** or end of text
- **li'u** at the very end of a *bridi* (nothing follows in the same sentence)
- **do'u** after a vocative phrase at sentence start
- **kei** at the end of the entire sentence
- **ku** after a description that immediately precedes the *selbri* via **cu**

Usually safe to elide (by convention, rarely ambiguous):

- **ku** before most *selbri*
- **ge'u** (GOI terminator) before sentence-final position
- **be'o** when the **be/bei** chain is the final component of a *tanru*

Must keep (parser will extend the construction otherwise):

Terminator	Keep when…
be'o	followed by a relative clause (poi/noi): without **be'o**, the clause attaches to the last **bei** argument instead of the whole *tanru*
kei	followed by another *sumti* filling x_2 of the abstractor: **le nu mi klama kei be le zarci** requires **kei** or the parser swallows **le zarci** into the abstraction
ku	before a *selbri* whose first word is a PA (number) — the number could be read as the inner quantifier of the description
ke'e	in mid-*tanru* when more *tanru* components follow the group
vau	in **gi'e** compound-*bridi* when the first *bridi* tail has trailing modifiers
fe'u	(fi'o terminator) before a non-logical connective immediately after a fi'o-modal
lu'u	(LAhE terminator) before another *sumti* that would be absorbed into the qualified *sumti*

Heuristic: elide terminators by default; restore them one at a time if a canonical Lojban parser (e.g., `camxes`) rejects or misparses the sentence.

PA Role Ambiguity

A PA (number) *cmavo* can fill several roles in the same grammatical position, creating ambiguity that requires context or terminators to resolve:

Role 1 — Outer quantifier (before a description):

> **re le gerku cu blabi**
>
> *Two of the dogs are white.*
>
> (re = outer quantifier)

Role 2 — Inner quantifier (between descriptor and *selbri*):

> **le re gerku cu blabi**
>
> *The two dogs are white.*
>
> (re = inner quantifier of le)

Role 3 — Bare number *sumti* (standalone):

> **re cu klama**
>
> *Two (things) come.*
>
> (re = number standing alone as sumti, implies lo re)

Role 4 — Part of a mekso expression:

> **li re su'i ci du li mu**
>
> *2 + 3 = 5*
>
> (re = numeral inside li…)

Role 5 — MOI *selbri* (with a MOI *cmavo*):

> **mi pamoi**
>
> *I am first.*
>
> (pa + moi ⟶ ordinal selbri)

Role 6 — Part of a quantifier phrase (with ROI/MAI/etc.):

> **mi reroi tavla**
>
> *I talk twice.*
>
> (re + roi = twice)

The critical ambiguity — a number immediately before a *selbri* could be outer quantifier or mekso:

> **pa klama** =
>
> *one comes*
>
> (outer quantifier — someone comes) **li pa** =
>
> *the number 1*
>
> (inside li… unambiguous)

When a number precedes a **le/lo** description directly, it is unambiguously an outer quantifier. When a number appears with no descriptor before a *selbri*, it is read as outer quantifier over an implicit **lo**. To use a number as a mekso value outside **li…**, wrap it in **li**.

PA before *selbri* after ku — the specific trap:

> **le gerku ku pa blabi**

Without **ku** this is: **le gerku pa blabi** — the parser could read **pa** as the inner quantifier of **le gerku** or the outer quantifier before **blabi**. The **ku** terminates the description cleanly, making **pa** unambiguously the outer quantifier for **blabi**.

Summary

The formal Lojban grammar defines:

- Three word classes (*cmavo*, *brivla*, cmene) by morphological shape
- Bridi structure: prenex + *sumti* + tense + *selbri* + *sumti*
- Tense as a stacked prefix (PU ZI FAhA VA ZAhO CAhA)
- Six connective positions with consistent truth-function vocabulary
- Terminator elision rules (greedy parser; elide when unambiguous; keep **be'o** before poi/noi, **kei** before nested *sumti*)
- Free modifier attachment (attitudinals, discursives, to/toi, sei/se'u)
- Quantifier prenex for logical variables

Terminator elision key points:

- The parser is greedy — terminators tell it where to stop
- **li'u** almost always kept; **vau** almost always dropped
- **be'o** required before relative clauses; **kei** required in nested abstractions
- When in doubt, include terminators

Prenex / quantifier scope key points:

- **zo'u** grammatically separates prenex from *bridi* body
- Leftmost prenex variable has widest scope (outermost quantifier)
- **ro da su'o de zo'u** ≠ **su'o de ro da zo'u** — order controls meaning
- Inner quantifiers (**ro le**) are scoped to one *bridi*; prenex variables (**da**) can span discourse
- **da'o** resets all variable bindings

Selbri variables:

- **bu'a/bu'e/bu'i** = bound variable *selbri* (stand for unknown predicates)
- **su'o bu'a zo'u** required in prenex (not bare **bu'a zo'u**); drop prenex ⟹ drop explicit **su'o**
- **ro bu'a** etc. keep the prenex; **broda** is informal — use **bu'a** for real variable binding
- **xi** subscripts extend **da**/… and **bu'a**/… when three of each are not enough

De Morgan's laws:

- **naku (A and B)** = **(not A) or (not B)**
- **naku (A or B)** = **(not A) and (not B)**
- **naku ro da** = **su'o da naku** (not-all = some-not)

- **naku su'o da** = **ro da naku** (none = all-not)

Logical variables and quantifiers:

- **da/de/di** = existential variables (something, something-else, a-third-thing)
- Bare **da** implies **su'o da** (at least one); explicit **ro da** = for all
- Prenex: **da de zo'u ...** — leftmost variable has widest scope
- Dropping the prenex: legal when variable scope order matches *bridi* order
- **da poi [*bridi*]** = restricted variable: only X that satisfy [*bridi*]

Quantifier scope:

- Left-to-right order in a *bridi* determines scope: **ci gerku cu batci re nanmu** → 3 dogs each bite 2 (possibly different) men
- Use a **termset** (**ce'e**) to force equal scope: both quantifiers range over the same objects

The problem of "any":

- Universal "any" (every X that...) → **ro da poi ...**
- **ro da poi** implies the set is non-empty; for pure conditionality use **go** in a prenex
- Existential "any" (one will do) → bind **da** inside an inner abstraction (**nu**, **ka**, etc.) so it is existential only within that scope

Negation boundaries:

- **naku** in a prenex creates a scope boundary; moving it past a quantifier inverts it: **ro** ↔ **su'o**
- **no da** = **naku su'o da** (none = not-at-least-one); negate it → **su'o da**
- Each time **naku** crosses one quantifier boundary, that quantifier flips; two adjacent negatives cancel

Formal spec: This friendly chapter is the conceptual skeleton — enough to see *why* sentences parse as they do. For machine-readable rules, use one of the parser tools listed in **Where the machine grammar lives** above.