

A decorative border in the top-left corner of the slide, composed of a grid of small orange squares and rectangles, creating a geometric pattern.

Ling 566

Oct 29, 2024

Lexical Rules

Overview

- How lexical rules fit in
- Three types of lexical rules, constraints
- Example: Plural noun lexical rule
- Advice on writing lexical rules
- Constant lexemes
- ARG-ST & ARP
- The feature FORM

Lexical Types & Lexical Rules

- Lexemes capture the similarities among *run*, *runs*, *running*, and *ran*
- The lexical type hierarchy captures the similarities among *run*, *sleep*, and *laugh*, among those and other verbs like *devour* and *hand*, and among those and other words like *book*.
- Lexical rules capture the similarities among *runs*, *sleeps*, *devours*, *hands*, ...

Is it clear what type of regularities are captured by lexical types and lexical rules? (take 3)



Not clear why we need either

0

Not clear what the difference is

0

Yes ...?

0

Yes

0

Parsimony & Plausibility

- Lexical rules capture **productive** generalizations.
- There may be some ‘precompiling’ going on as well.

Three Kinds of Lexical Rules

- Inflectional: *lexeme* to *word*

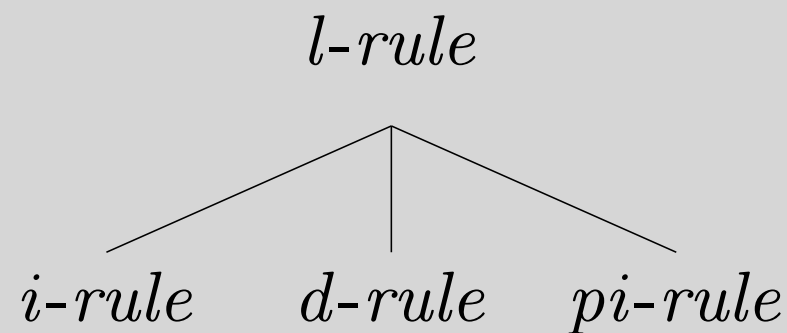
Examples?

- Derivational: *lexeme* to *lexeme*

Examples?

- Post-Inflectional: *word* to *word*
(Chapters 11, 13, 14)

Three Subtypes of *l-rule*



$$l\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad l\text{-sequence} \left\langle X, [\text{SEM} \quad / \boxed{2}] \right\rangle \\ \text{OUTPUT} \quad l\text{-sequence} \left\langle Y, [\text{SEM} \quad / \boxed{2}] \right\rangle \end{array} \right]$$

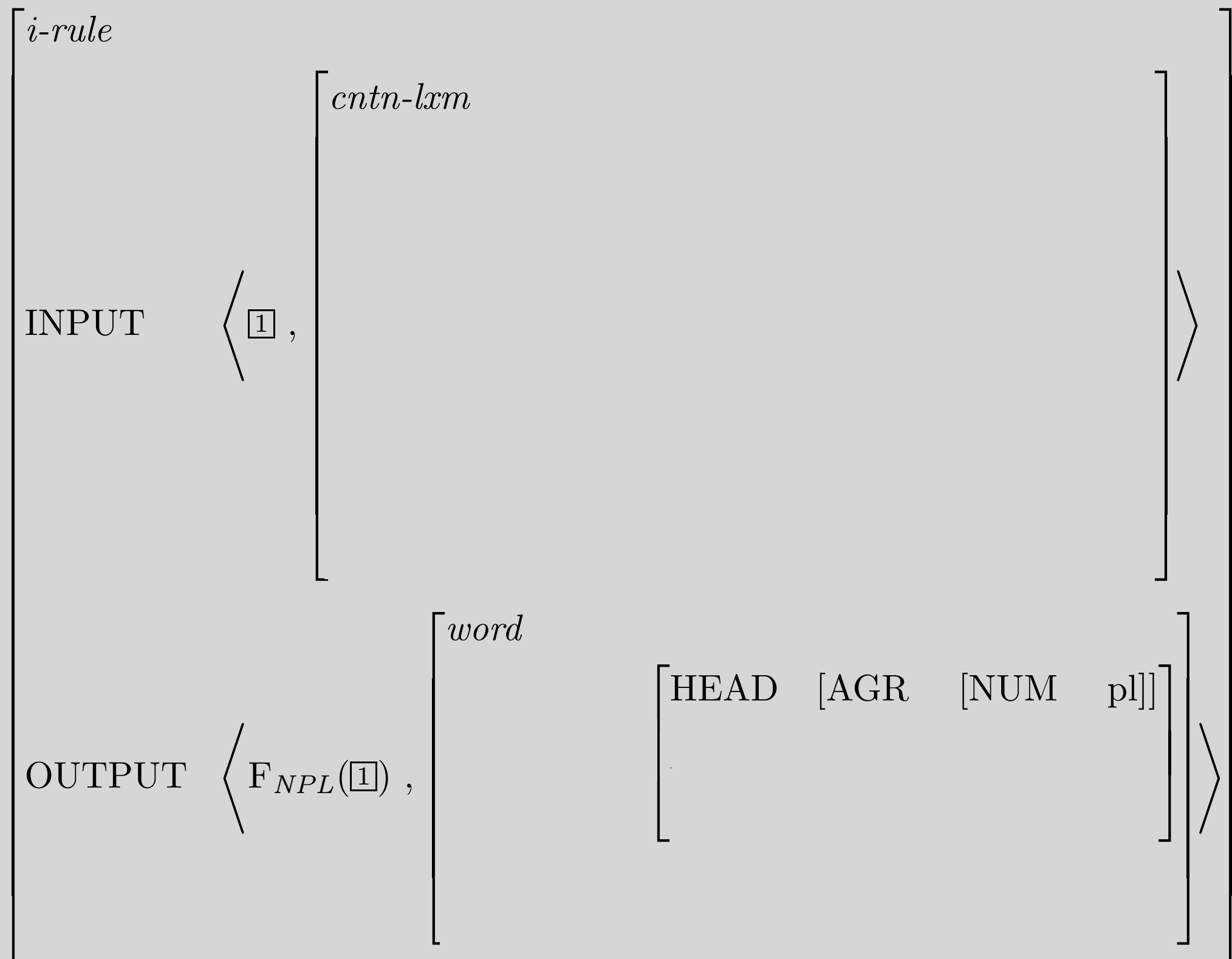
$$i\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad \left\langle X, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad \boxed{3} \\ \text{ARG-ST} \quad \boxed{A} \end{array} \right] \right\rangle \\ \text{OUTPUT} \quad \left\langle Y, \left[\begin{array}{l} \text{word} \\ \text{SYN} \quad \boxed{3} \\ \text{ARG-ST} \quad \boxed{A} \end{array} \right] \right\rangle \end{array} \right]$$

$$d\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad \left\langle X, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad / \boxed{3} \end{array} \right] \right\rangle \\ \text{OUTPUT} \quad \left\langle Y, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad / \boxed{3} \end{array} \right] \right\rangle \end{array} \right]$$

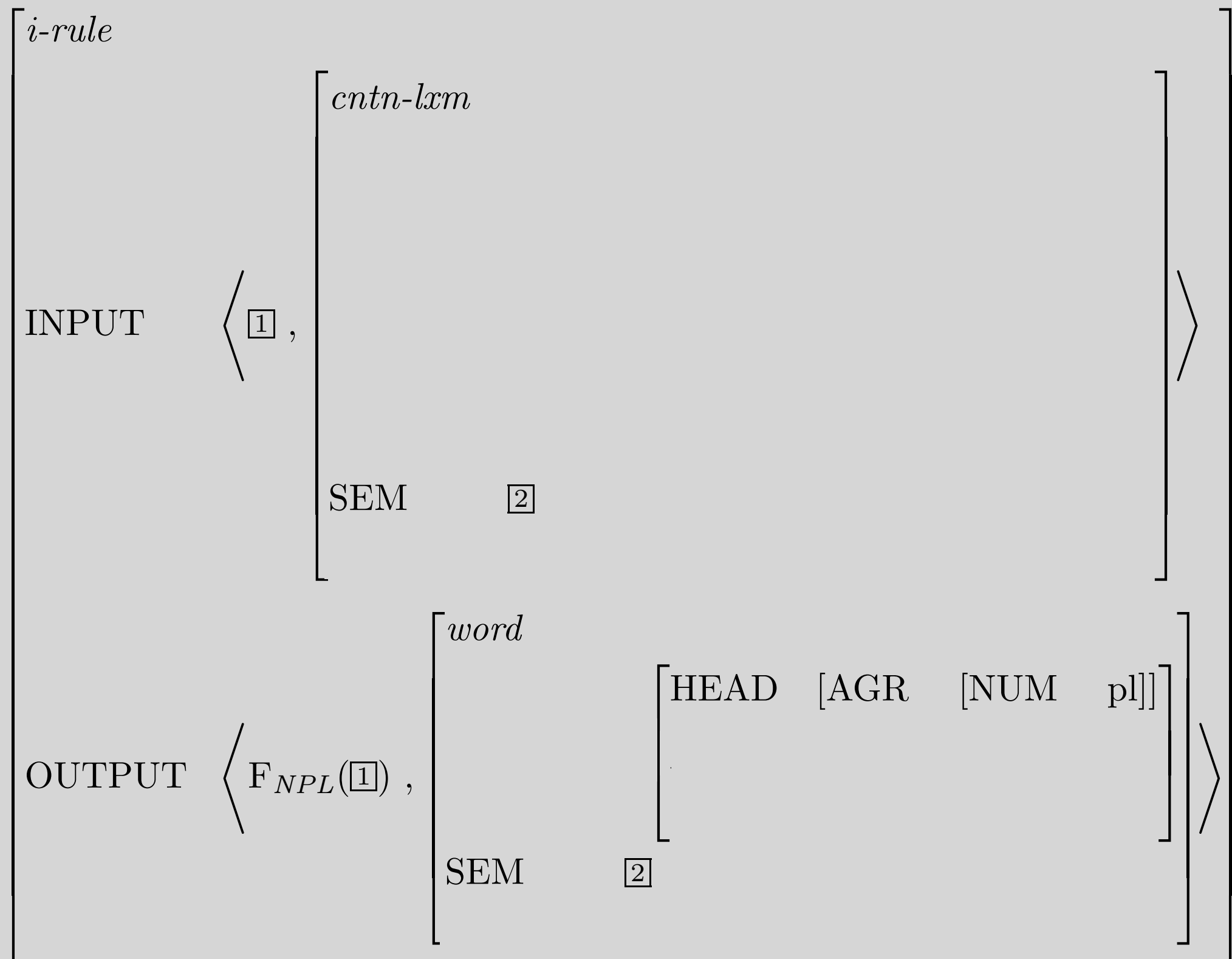
Plural Noun LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \text{cntn-lxm} \rangle \\ \text{OUTPUT} \quad \left\langle F_{NPL}(\boxed{1}), \left[\text{SYN} \left[\text{HEAD} \left[\text{AGR} \left[\text{NUM} \text{pl} \right] \right] \right] \right] \right\rangle \right. \end{array} \right]$$

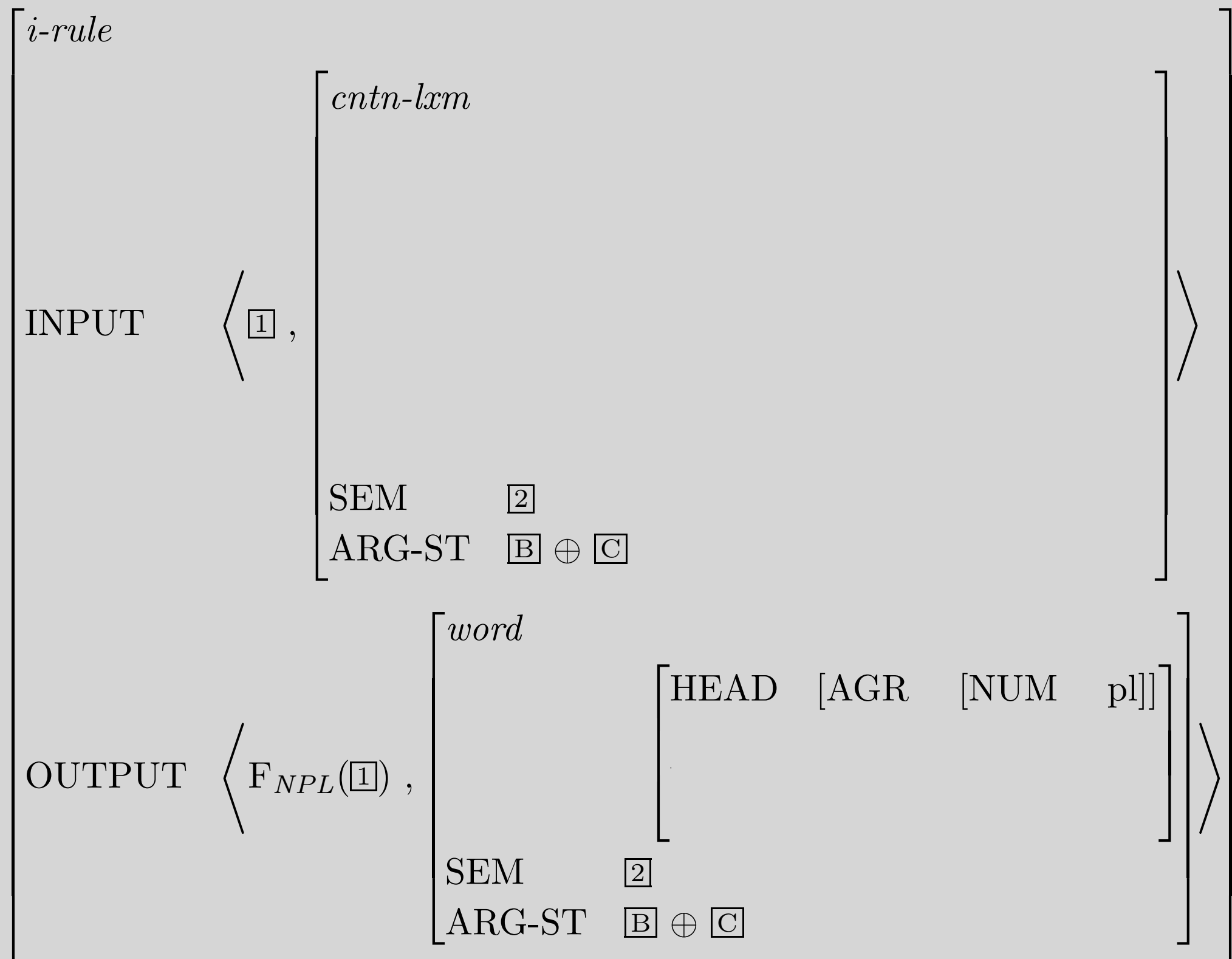
Plural Noun LR with Inherited Constraints



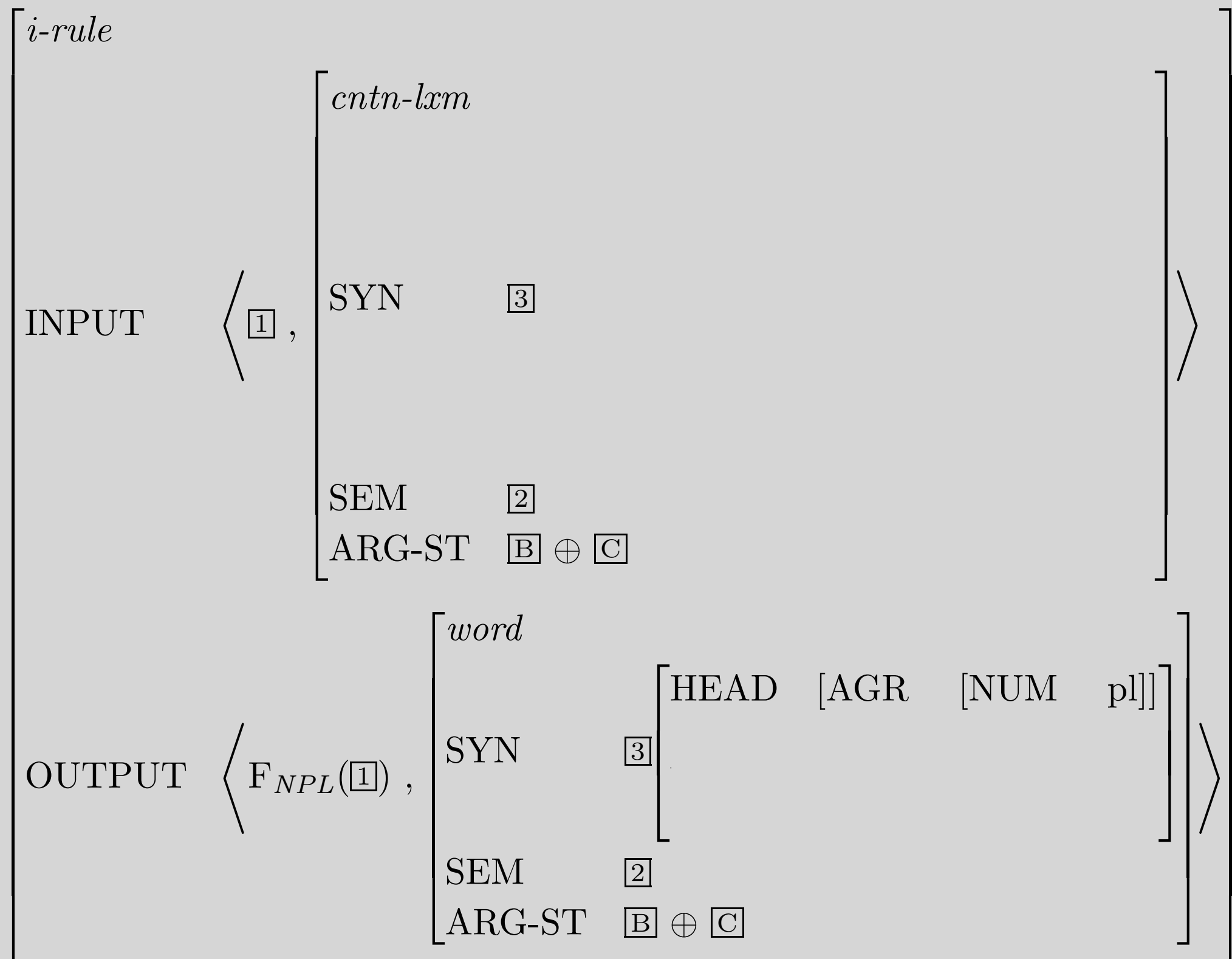
Plural Noun LR with Inherited Constraints



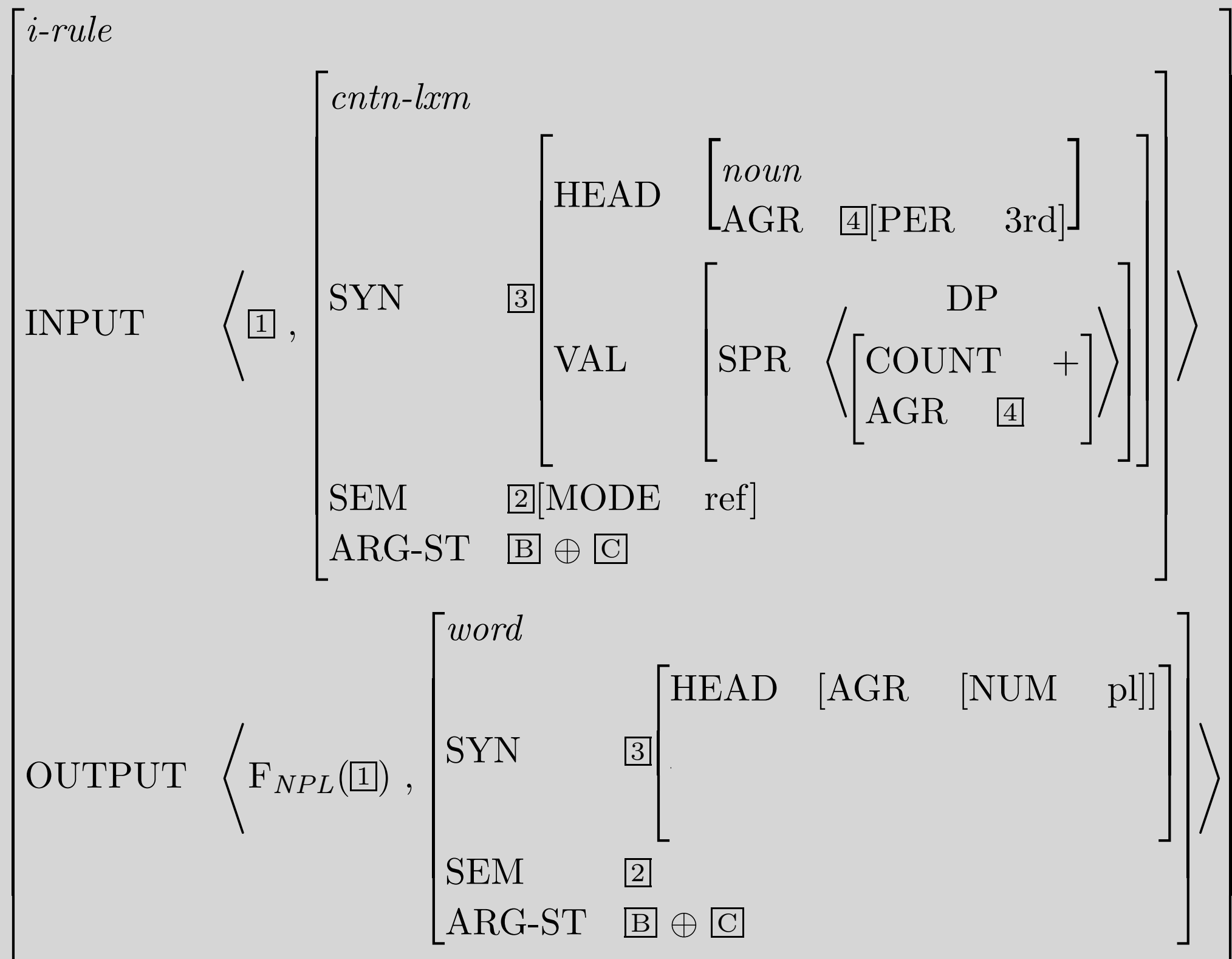
Plural Noun LR with Inherited Constraints



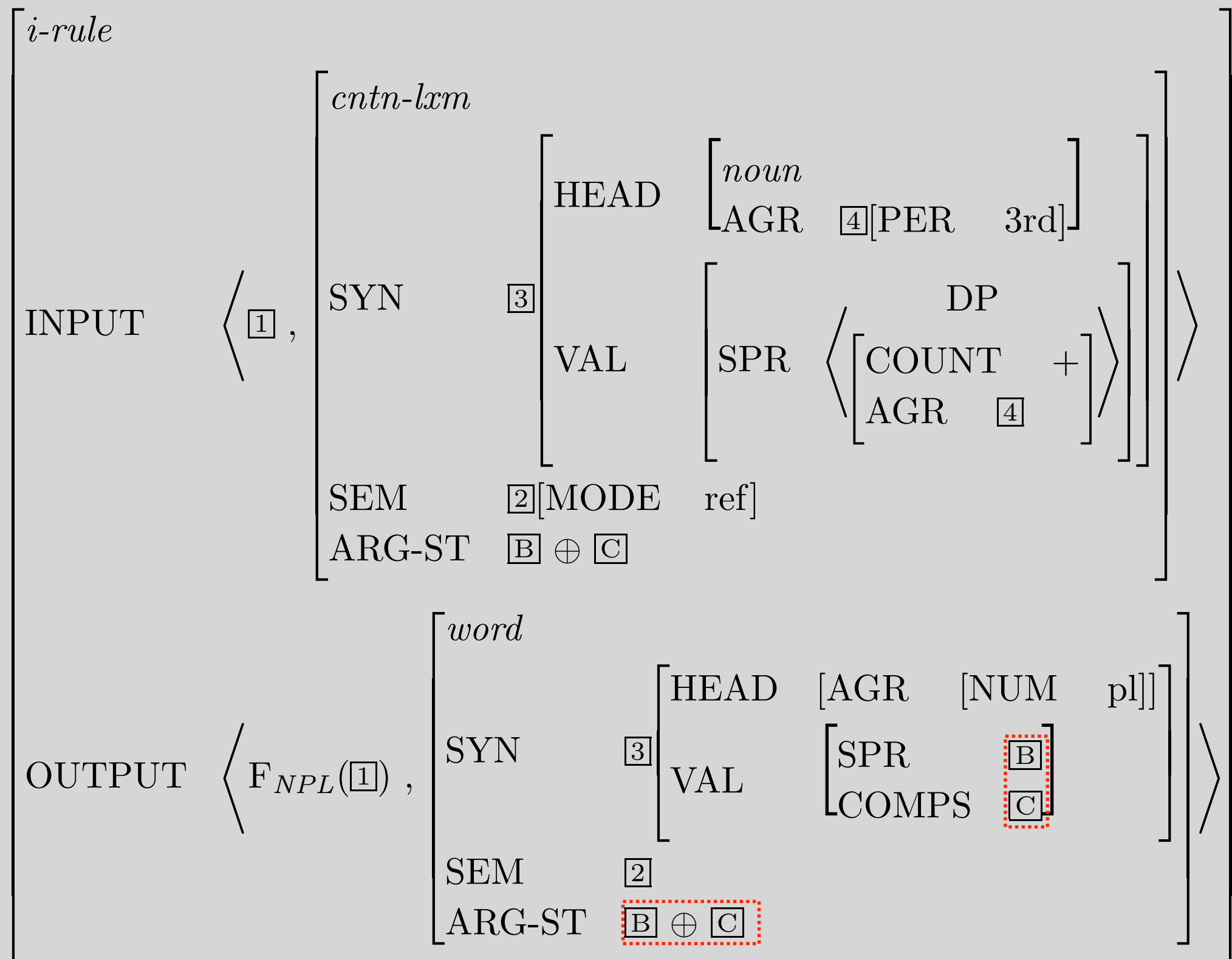
Plural Noun LR with Inherited Constraints



Plural Noun LR with Inherited Constraints



Plural Noun LR with Inherited Constraints



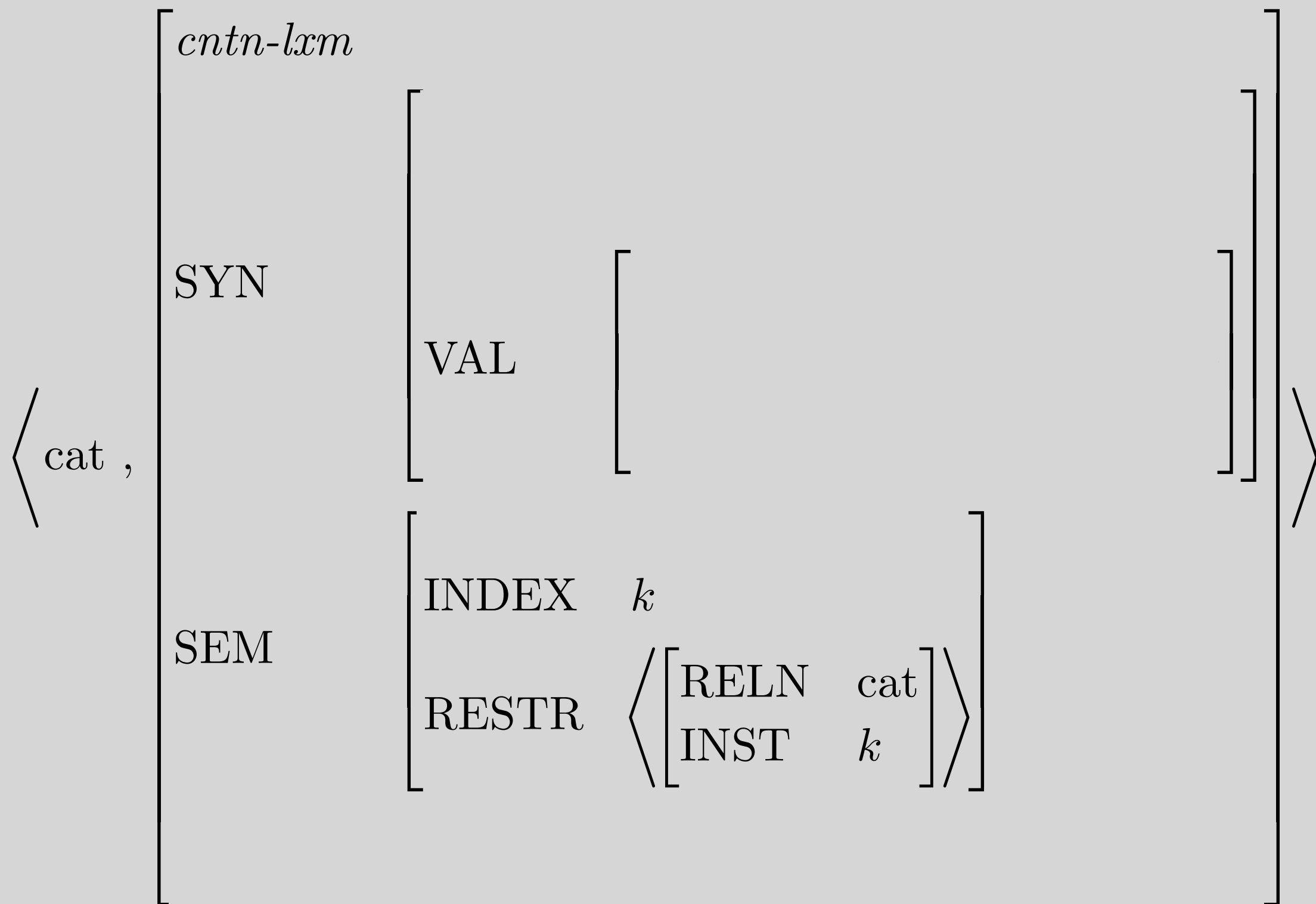
Practicalities - Applying Lexical Rules

- INPUT is a family of lexical sequences.
- OUTPUT is another family of lexical sequences.
 - ...usually a smaller family
 - ...usually a disjoint one
- The only differences between the families are those stipulated in the rule (or the rule's type).
- Similarities are handled by the constraints on *l-rule* and its subtypes.
- If we've written the LR's correctly, nothing is left unconstrained.

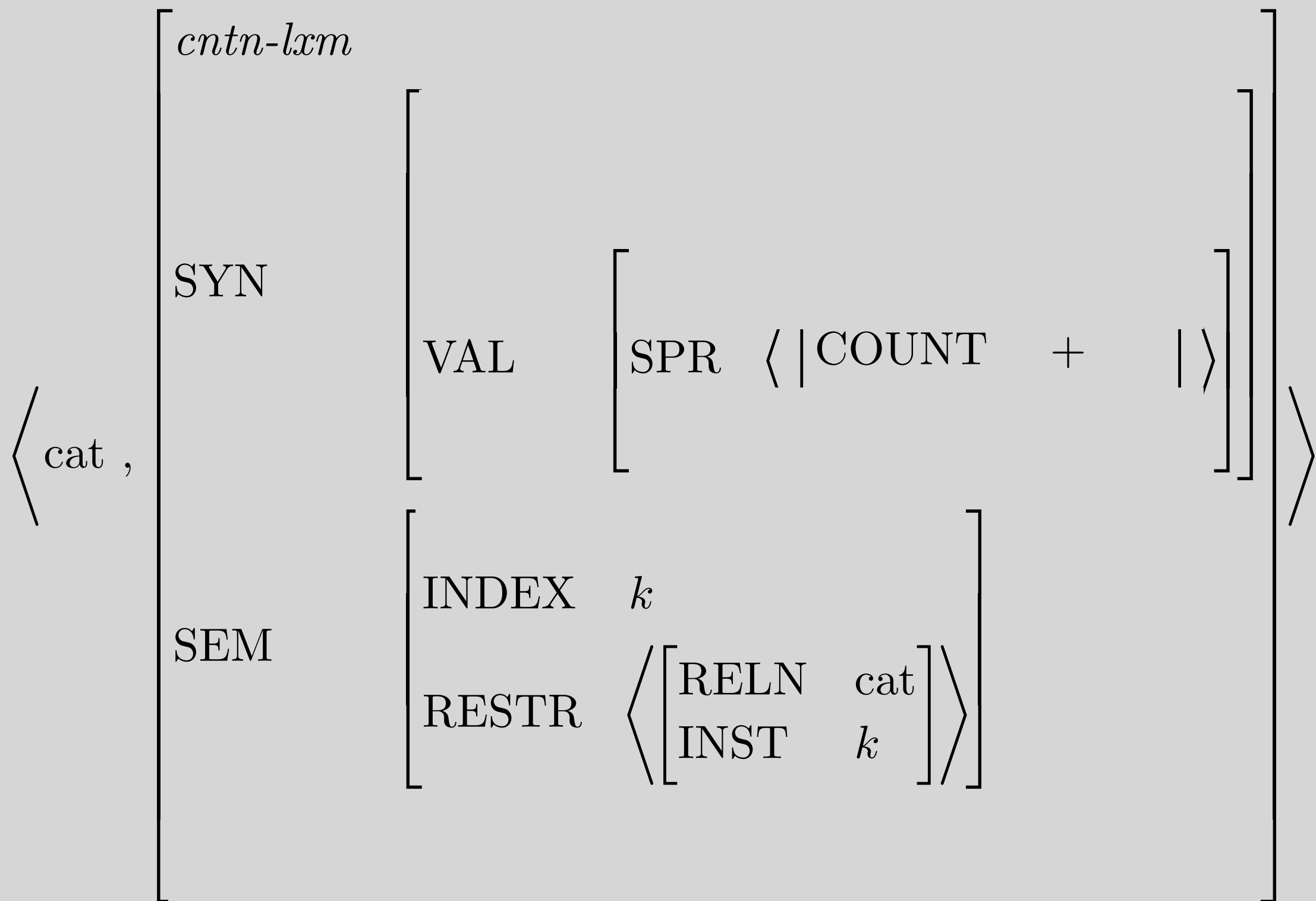
Example: Lexical Entry for *cat*

$$\left\langle \text{cat} , \left[\begin{array}{l} \text{cntn-lxm} \\ \text{SEM} \end{array} \left[\begin{array}{l} \text{INDEX} \quad k \\ \text{RESTR} \quad \left\langle \left[\begin{array}{l} \text{RELN} \quad \text{cat} \\ \text{INST} \quad k \end{array} \right] \right\rangle \end{array} \right] \right] \right\rangle$$

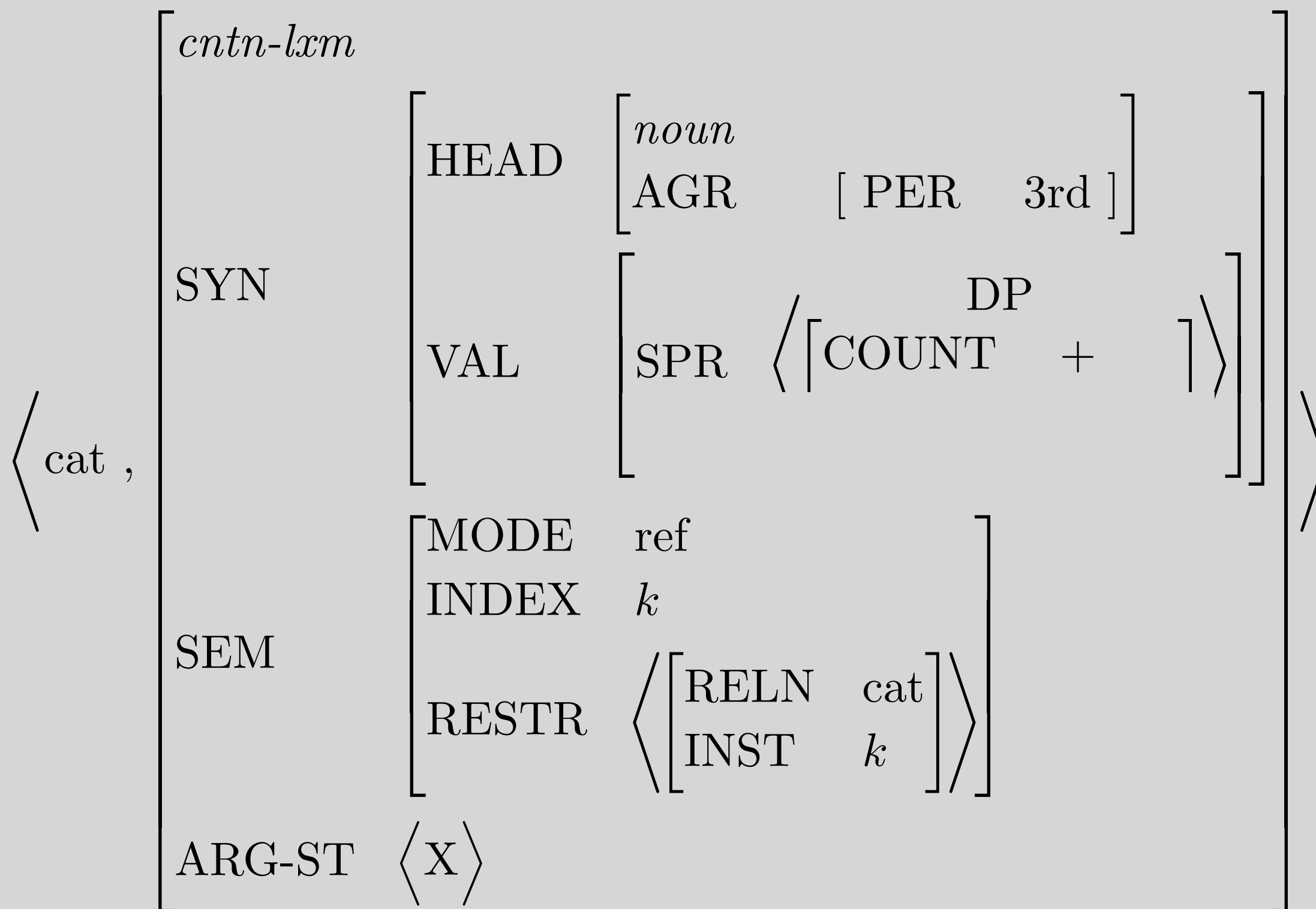
Example: *cat*, with inheritance



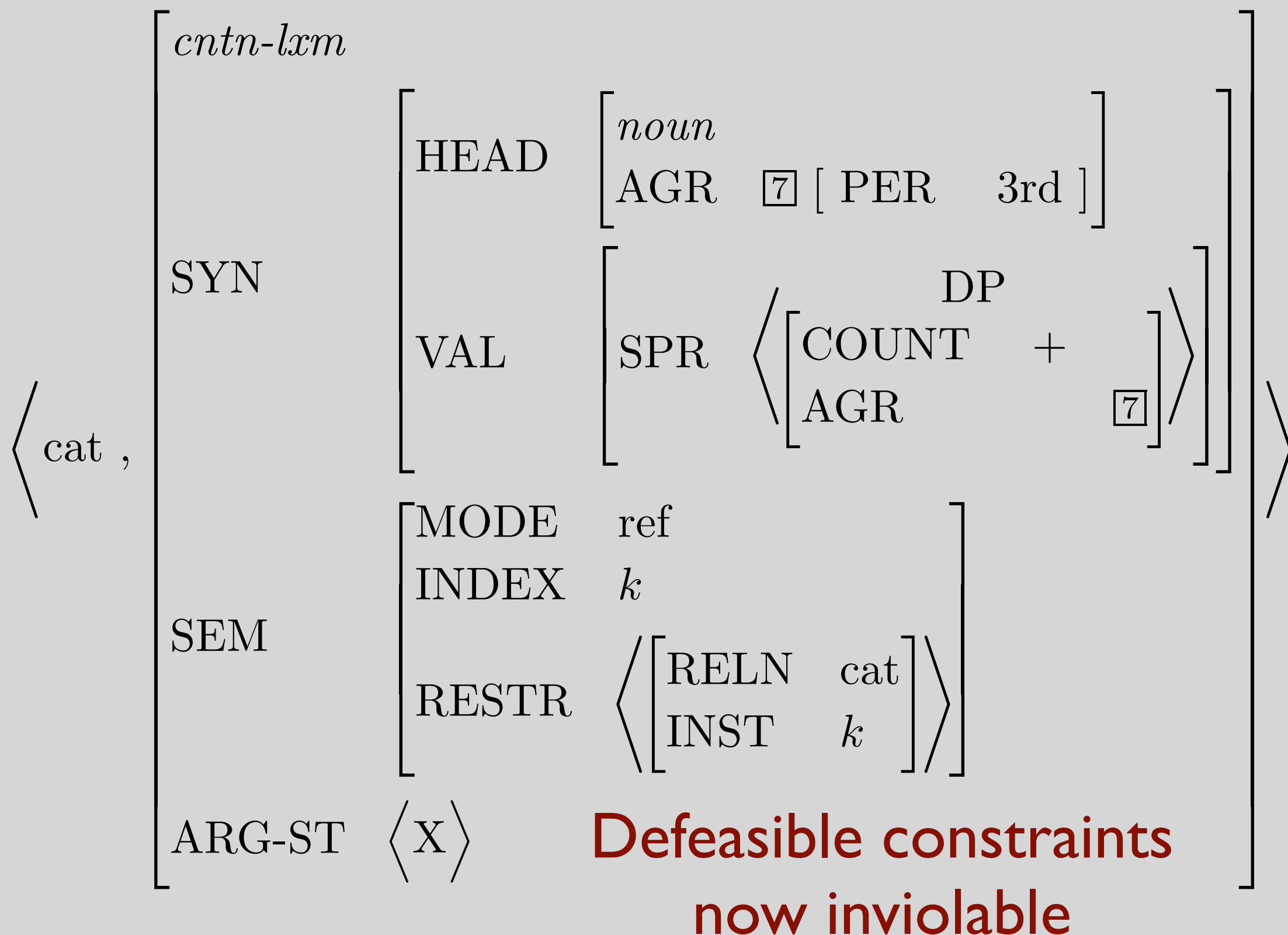
Example: *cat*, with inheritance



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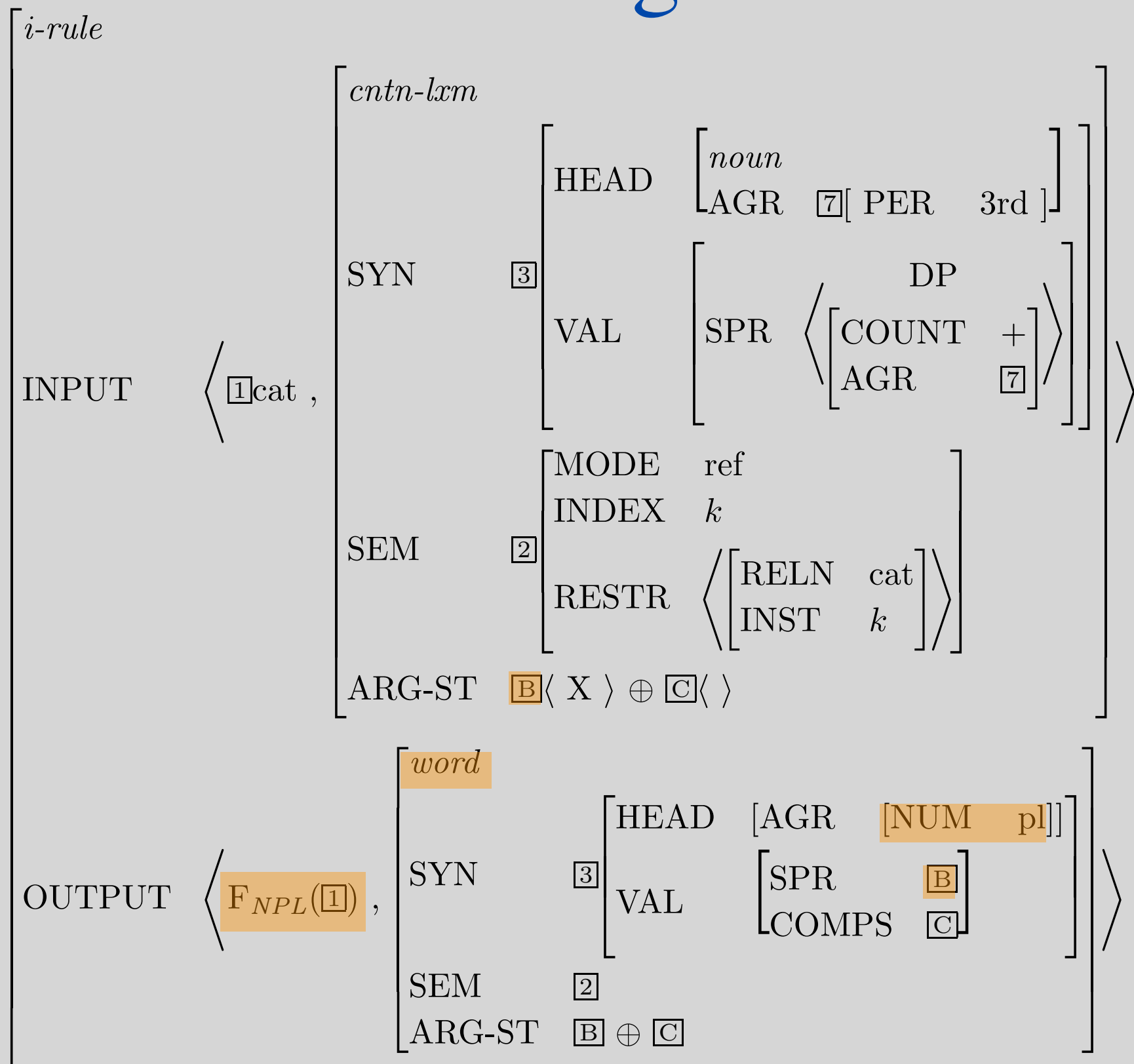
Example: *cat*, with inheritance



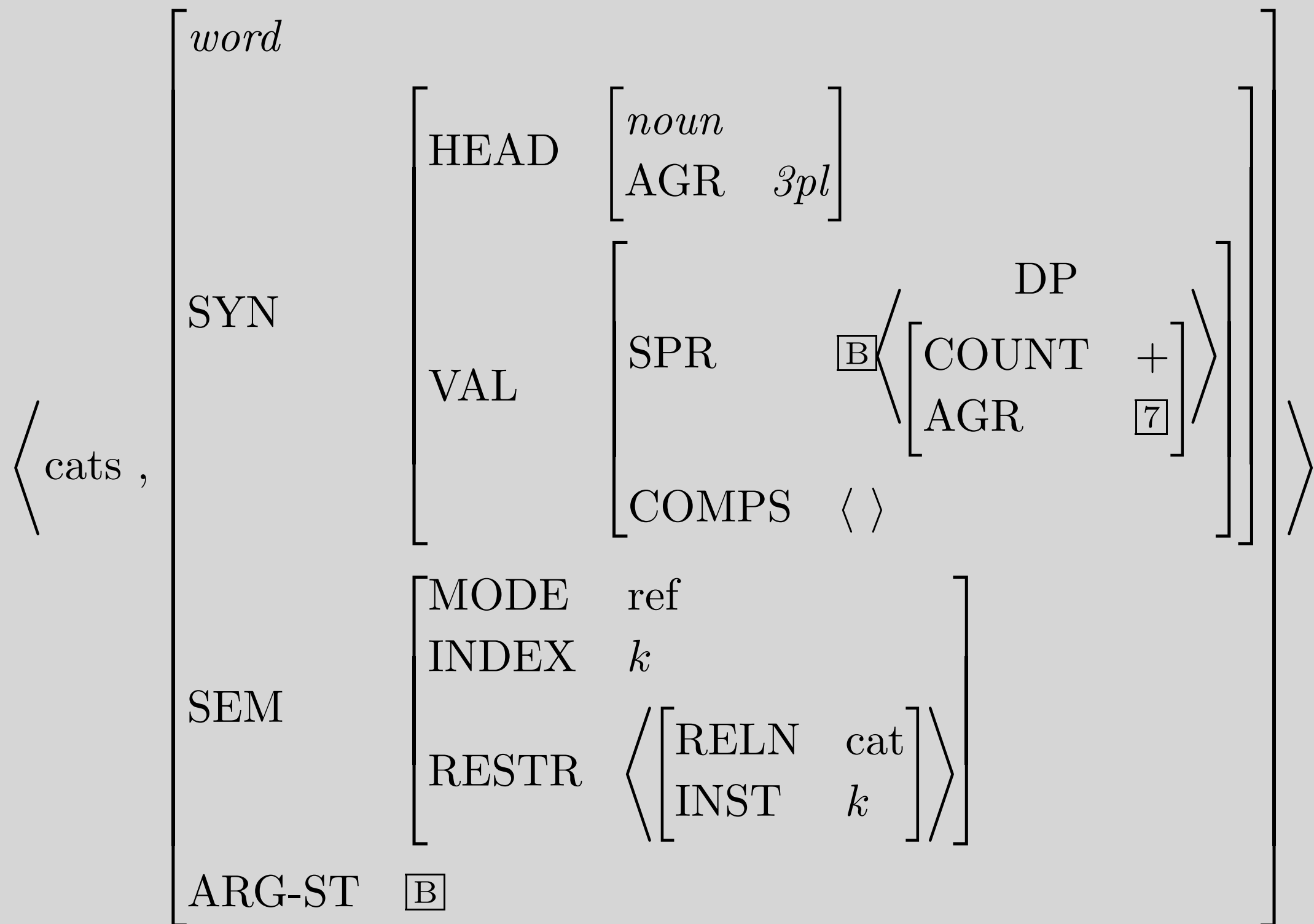
Plural Noun LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \text{cntn-lxm} \rangle \\ \text{OUTPUT} \quad \left\langle F_{NPL}(\boxed{1}), \left[\begin{array}{l} \text{word} \\ \text{SYN} \left[\text{HEAD} \left[\text{AGR} \left[\text{NUM} \text{pl} \right] \right] \right] \right] \right\rangle \end{array} \right. \right]$$

Licensing *cats*



cats: The (family of) Lexical Sequence_(s)



Practicalities -- Writing Lexical Rules

- Determine the type of the LR.
- Determine the class of possible inputs.
- Determine what should change.
 - If INPUT and OUTPUT values are identified (by default or otherwise) and only OUTPUT value is mentioned, then...
information is added.

(Lexical sequences incompatible with that value are not possible inputs)
 - If INPUT and OUTPUT values are identified by default, but different values are given on the INPUT and OUTPUT of the rule, then...
information is changed.
 - If INPUT and OUTPUT values are identified by an inviolable constraint, but different values are given on the INPUT and OUTPUT of the rule, then...
there is no well-formed output

Constant lexemes

- What kinds of words are constant lexemes in our grammar?
- Why do we need a rule for these words?
- What would be an alternative analysis?

Constant Lexeme LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \text{const-lxm} \rangle \\ \text{OUTPUT} \quad \left[\text{FIRST} \quad \boxed{1} \right] \end{array} \right]$$

- What keeps this from applying to, say, verb lexemes?
- Why is this an *i-rule*?

Constant Lexeme LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \text{const-lxm} \rangle \\ \text{OUTPUT} \quad \langle \boxed{1}, [] \rangle \end{array} \right]$$

- What keeps this from applying to, say, verb lexemes?
- Why is this an *i-rule*?

Is it clear what type of regularities are captured by lexical types and lexical rules? (take 4)



Not clear why we need either

0

Not clear what the difference is

0

Yes ...?

0

Yes

0

ARG-ST & ARP

- Given the ARP, what do we need to specify about the valence properties of words?
- Why isn't the ARP a constraint on the type *lexeme*?

The Feature FORM

- Different inflected forms of verbs show up in different syntactic environments. Examples?
- These different forms are syntactically distinguished by the feature FORM, as assigned by lexical rules.
- FORM is also useful in our analyses of coordination and PP selection.

How do we rule these out?

- *Kim eat pizza.
- *Kim seems to eats pizza.
- *Dana helped Leslie [pack and moved].
- *Kim relies for Sandy.
- *Dana walked and Kim.

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- Reading Questions

Reading Questions

- lexeme
- lexical entry
- lexical rule
- lexical rule instantiation
- lexical sequence
- word structure

RQs: Generalizations

- What happens if a phenomenon is too specific to be captured by a generalization but too rare to merit its own rule? Do exceptions have to be formalized? Are they still exceptions after being formalized?

RQs: FORM, Imperatives

- It seems like defining the initial symbol as finite excludes imperative utterances from being stand-alone sentences. Why would we want to do that?

RQs: FORM, Coordination

- Page 250: I am a little confused on the rationale for using FORM to define part of speech. Page 250 says that we can't use HEAD values because that would disallow conjuncts with different AGR values. However, 248 introduced FORM as a HEAD feature. So why are we still using FORM here?

RQs: Morphophonological Fs

- Regarding the functions for morphological processes: What else can these functions do besides what is demonstrated in this chapter? Can they apply morphemes to verbs as well (e.g. "re-," which I believe can go on most verbs but maybe not all)? Can they be used to handle compound words, where maybe there is a function to combine the semantics of two lexemes?

RQs: Morphophonological Fs

- The functions that are used to describe the affixes are a bit confusing to me. Where do they come from? How do they apply to words that don't follow the normal affix patterns? Is that something that is left up to morphology and for the purpose of HPSG it doesn't matter the finer implementation?

RQs: SPR/COMPS, ARG-ST

- Is there any particular reason why constraints on SPR/COMPS items are sometimes split between SPR/COMPS and ARG-ST? For example, in (63) on page 253, AGR is given for the specifier in SPR, but the fact that it's a [COUNT +] DP is in ARG-ST.

RQs: Weird feature structures

- I did not quite understand how Figure 74 in Section 8.7.4 is a lexical sequence that licenses not words. Also, what is an example of a lexical rule that prevents such "bizarre trees"?

RQs: Tense semantics

- (69) on page 256: Why use ... to stand in for tense predications added to RESTR? I see the footnote that tense semantics is beyond the scope of what we're doing here but I was curious about the reasoning for using ... specifically.

RQs: Tense semantics

- In lexical rules for verbs, we add a predication in the output to represent tense information. However, in the rules for nouns, we don't include a similar predication for number. What is the motivation behind this difference? Are there other features, aside from tense, that also need to be explicitly encoded in the semantics, such as the passive voice?

RQs: Lexrule vs. underspecification

- In contrast to other i-rules, the Singular Noun Lexical Rule only produces one feature change (NUM to sg), maintaining the same string. Would it be practical to formulate this as a disjunction (to control the possible NUM values) in the lexeme type? I am confused about the balancing act between underspecification and lexical rules as tools to get words "for free" from a grammar designer's perspective.

RQs: Lexrule vs. underspecification

- I wondered about the guiding principles for determining whether syntactic and semantic features should be encoded lexically or inherited through syntactic structures. Is there a widely accepted approach or consensus on feature distribution?

RQs: Lexical rules v. transformations

- It sounds like the input and output mechanism is almost like the idea of transformation that was briefly mentioned at the beginning of the book, except on a lexeme/lexical entry level. How do they differ?

RQs: More complex morphological systems

- Regarding lexical rules, we currently choose the lexeme form of a word as input. However, for languages with rich inflectional morphology, it is not feasible to always use a lexeme as input, as different inflectional markers may stack sequentially on the lexeme. How should lexical rules handle such cases? For example, with a word in the form of lexeme-gendmark-nummark, how can we avoid writing a separate singular rule for each gender marker?



RQs: