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Discussion Section Practice Sheet: Rule Making

November 11, 2021

Problem 1

For the following dataset, determine the status of [t], [d], [s], and [z]. Which of these phones are in allophonic distribution? Which of these phones are contrastive? For phones in allophonic distribution, what is the underlying phoneme?

(1)	[tapino]	[idame]	[dabizin]	[dozin]
	[bedezi]	[otokos]	[nokto]	[odot]
	[somiksa]	[metsu]	[dopos]	[kozob]
	[ezin]	[nenezem]	[evetizi]	[iskazi]

Problem 2

For the following dataset, determine the status of [i] and [y]. Are these phones in allophonic distribution or are they contrastive? If the phones are in allophonic distribution, what is the underlying phoneme, and what are the rules that derive each phone? If they contrastive, how did you come to that conclusion?

(2)	[su̥ki]	[mupani]	[nunam]	[tapi]
	[ty̥tu]	[ti̥kanki]	[kosi]	[ku̥ki]
	[kuni]	[coti̥ki]	[ki̥si]	[tsy̥ko]
	[ki̥ta]	[tynu]	[pu̥ti]	[icani]

For the above dataset, is there a phonemic contrast between voiced and voiceless vowels? If not, what is the allophonic rule that determines vowel devoicing in this language?

Problem 3

For the following dataset, determine the status of labialization (denoted with [ʷ] after the labialized consonant) in this language. Are labialized consonants and their non-labialized counterparts in allophonic distribution, or contrastive? For phones in allophonic distribution, what is the underlying phoneme, and what are the rules that derive each phone? For this problem, assume that labialization adds the features [+Lab] and [+Round]. Does labialization apply to all consonants?

(3)	[ilŋ^{w}op^{w}up]	[ɲetube]	[atŋin]	[yɸg^{w}u]
	[ŋ^{w}øɲb^{w}unk^{w}ø]	[sepita]	[m^{w}uga]	[noke]
	[ŋ^{w}y]	[xasim^{w}ø]	[yɸgesi]	[mime]
	[kisosu]	[ɲedøɬy]	[ɸenisø]	[ex^{w}yto]

Below are more words from the same language; what do they suggest about whether or not labialized consonants are in complementary distribution with non-labialized consonants? Does this change what rule you determined for the above dataset? Why or why not?

(4)	[k^{w}epso]	[m^{w}øpik^{w}]	[g^{w}ølk^{w}i]	[opk^{w}a]
	[g^{w}edek]	[g^{w}iwølp^{w}u]	[ŋ^{w}iɲite]	[x^{w}ax^{w}a]

Problem 4

For the following dataset, determine the status of [s] and [ʃ]. These phones are in allophonic distribution. Determine which is the underlying form and the rule(s) that derive the surface forms. If syllable boundaries are involved, determine how this language determines syllable boundaries. What restrictions are there on onsets?

(5)	[puʃke]	[masi]	[sup^{h}e]	[uʃkit^{h}es]
	[nusa]	[ketes]	[susik^{h}e]	[estikuʃ]
	[kuseba]	[mimuʃ]	[sitas]	[tikis]
	[t^{h}ojsu]	[saliki]	[uʃmisa]	[miska]

In this language, there is another word pronounced [oskiman]. Is this predicted in the analysis you gave for the above data set? If not, what changes must be made to the rule to accomodate this new word?

Problem 5

Given the data set below, find the underlying forms of each word, as well as of each of the suffixes representing nominative singular, genitive singular, nominative plural, and genitive plural (one of these will have a null suffix). Find the rules determining the surface forms (I've made it so that there are five rules, but they are all relatively simple). Do any of these rules require a specific ordering? If so, what kind of interaction do those rules have?

(6)

Nom. Sing.	Gen. Sing.	Nom. Plur.	Gen. Plur.
[ukpi]	[ukpisɛ]	[ukpifɔ]	[ukpik]
[ɛmit]	[ɛmidɛ]	[ɛmitfɔ]	[ɛmidɛk]
[bɛ]	[bɛsɛ]	[bɛfɔ]	[bɛk]
[azip]	[azibɛ]	[azipfɔ]	[azibɛk]
[pɔfɛ]	[pɔfɛsɛ]	[pɔfɛfɔ]	[pɔfɛk]
[kimdadɔm]	[kimdadɔmɛ]	[kimdadɔmfɔ]	[kimdadɔmɛk]
[kɛsifup]	[kɛsifupɛ]	[kɛsifupfɔ]	[kɛsifupɛk]
[ɔfpit]	[ɔfpitɛ]	[ɔfpitfɔ]	[ɔfpitɛk]
[tasin]	[tasinɛ]	[tasimfɔ]	[tasinɛk]
[ɔmkɔ]	[ɔmkɔsɛ]	[ɔmkɔfɔ]	[ɔmkɔk]
[kiksɔn]	[kiksɔnɛ]	[kiksɔmfɔ]	[kiksɔnɛk]
[kistitum]	[kistitumɛ]	[kistitumfɔ]	[kistitumɛk]
[atɔni]	[atɔnisɛ]	[atɔnifɔ]	[atɔnik]

Solution 1

[t] and [d] are not in allophonic distribution. Both occur intervocalically and word initially. [z] only occurs intervocalically, while [s] does not occur intervocalically. Because [s] occurs word initially, word medially ([somiksa] and [iskazi]) and word finally, it occurs in more varied contexts than [z] does, and so /s/ is likely the underlying form, which surfaces as [z] intervocalically.

Solution 2

[i] and [y] are in allophonic distribution. [y] occurs before syllables with rounded vowels ([u] and [o]) while [i] appears elsewhere. Because [i] appears in multiple contexts (before non-rounded vowels, word finally), we can assume that the underlying phone is /i/. The rule is derived as such:

(7) $$\begin{bmatrix}+ & \textsc{front}\\ + & \textsc{syl}\end{bmatrix} \rightarrow \begin{bmatrix}+ & \textsc{round}\end{bmatrix} / \_\_\mathrm{C} \begin{bmatrix}+ & \textsc{round}\end{bmatrix}$$

There is not a phonemic contrast between voiced and voiceless vowels; they are in allophonic distribution where voiceless vowels appear when the vowel is high, and only between two voiceless segments, while voiced vowels appear elsewhere. We can assume the voiced vowels are underlying and the rule that derives voiceless consonants is as such:

(8) $$\begin{bmatrix}+ & \textsc{hi}\\ + & \textsc{syl}\end{bmatrix} \rightarrow \begin{bmatrix}- & \textsc{voi}\end{bmatrix} / \begin{bmatrix}- & \textsc{voi}\end{bmatrix} \_\_ \begin{bmatrix}- & \textsc{voi}\end{bmatrix}$$

Solution 3

Labialized consonants are in allophonic distribution with their non-labialized forms. The segments are underlyingly not labialized, and become labialized before rounded vowels. This only applies to non-coronal consonants. A rule can be defined as such:

(9) $$\begin{bmatrix}- & \textsc{cor}\end{bmatrix} \rightarrow \begin{bmatrix}+ & \textsc{lab}\\ + & \textsc{round}\end{bmatrix} / \_\_ \begin{bmatrix}+ & \textsc{round}\end{bmatrix}$$

The additional data shows that labialized velar consonants can appear before non-rounded vowels. This suggests that labialized velar consonants are not in complementary distribution with non-labialized velar consonants, as they both may appear in the same context (before unrounded vowels). The data does not suggest that there is a phonemic distinction between rounded and unrounded labials, and also does not suggest that non-labialized velar consonants can appear before rounded vowels. Because all velar consonants before rounded vowels are labialized, the rule defined above does not have to change: underlyingly non-labialized velars are realized as labialized before rounded consonants, while underlyingly labialized velars are realized as labialized before both rounded and unrounded vowels.

Solution 4

[ʃ] appears word finally after [u], and between a preceding [u] and a following consonant. [s] appears elsewhere. At first it seems like these both have multiple contexts in which they appear, but we might be able to predict that the word final context and the context preceding a consonant following a vowel are both covered as segments at the end of a syllable. If we take this language to have at maximum one segment onset, then words like [puʃke] would be syllabified as [puʃ.ke], words like [mimuʃ] are syllabified [mi.muʃ], and words like [nusa] are syllabified [nu.sa]. In [puʃ.ke] and [mi.muʃ], [ʃ] follows [u] and is at the end of a syllable, while for [nu.sa], [s] is after a [u] but at the beginning of a syllable. Thus we can define a rule as follows:

$$(10) \qquad \begin{bmatrix} + & \text{CONT} \\ + & \text{COR} \\ - & \text{SON} \end{bmatrix} \rightarrow \begin{bmatrix} - & \text{ANT} \\ + & \text{DIST} \end{bmatrix} / \begin{bmatrix} + & \text{ROUND} \end{bmatrix} \_\_]_\sigma$$

The additional word [oskiman] is a problem for this rule, as it contains a round vowel followed by a syllable final [s]. However, in this case the vowel is [o] rather than [u], so we only have to change the rule slightly, by adding another condition: the preceding vowel has to be high in order for the rule to take place.

$$(11) \qquad \begin{bmatrix} + & \text{CONT} \\ + & \text{COR} \\ - & \text{SON} \end{bmatrix} \rightarrow \begin{bmatrix} - & \text{ANT} \\ + & \text{DIST} \end{bmatrix} / \begin{bmatrix} + & \text{ROUND} \\ + & \text{HI} \end{bmatrix} \_\_]_\sigma$$

Solution 5

The underlying forms are as below:

(12)
a. /ukpi/
b. /ɛmid/
c. /bɛ/
d. /azib/
e. /pɔfɛ/
f. /kimdadɔm/
g. /kɛsifup/
h. /ɔfpit/
i. /tasin/
j. /ɔmkɔ/
k. /kiksɔn/
l. /kistitum/
m. /atɔni/
n. Nominative Singular: Ø
o. Genitive Singular: /ɛ/
p. Nominative Plural: /fɔ/
q. Genitive Plural: /k/

There are four rules which govern the sound changes in the dataset. The first of these sound changes adds an epenthetic [s] between two vowels (applies in the creation of the Genitive Singular in most instances; e.g.: /ukpi-ɛ/ becomes [ukpisɛ]). The second change adds an epenthetic [ɛ] between two consonants word finally, this is seen in the Genitive Plural forms in cases where the root ends in a consonant (e.g.: /ɛmid-k/ becomes [ɛmidɛk]) . The third change devoices obstruents word finally, this can be seen in the nominative singular forms (e.g.: /ɛmid/ becomes [ɛmit]). The fourth change devoices obstruents before voiceless consonants, this can be seen in the nominative plural endings when the root ends in a voiced obstruent (e.g.: /ɛmid-fɔ/ becomes [ɛmitfɔ]). The fifth change assimilates /n/ in place of the following consonant, this can be seen in nominative plural endings when the root ends.

(13)

a. $\emptyset \rightarrow \begin{bmatrix} - & \textsc{son} \\ + & \textsc{cont} \\ + & \textsc{cor} \end{bmatrix} /\mathrm{V}\_\mathrm{V}$

b. $\emptyset \rightarrow \begin{bmatrix} + & \textsc{syl} \\ - & \textsc{tense} \\ - & \textsc{hi} \\ - & \textsc{low} \\ + & \textsc{front} \end{bmatrix} /\mathrm{C}\_\mathrm{C}\#$

c. $\begin{bmatrix} - & \textsc{son} \end{bmatrix} \rightarrow \begin{bmatrix} + & \textsc{voi} \end{bmatrix} /\_\#$

d. $\begin{bmatrix} - & \textsc{son} \end{bmatrix} \rightarrow \begin{bmatrix} + & \textsc{voi} \end{bmatrix} /\_\begin{bmatrix} - & \textsc{son} \end{bmatrix}$

e. $\begin{bmatrix} + & \textsc{nas} \\ + & \textsc{cor} \end{bmatrix} \rightarrow \begin{bmatrix} \alpha & \textsc{place} \end{bmatrix} /\_\begin{bmatrix} - & \textsc{syl} \\ \alpha & \textsc{place} \end{bmatrix}$

Rules (13b) and (13d) are strictly ordered, where (13b) must occur before (13d), as if (13d) occurred first, then words which have epenthesis apply to word final consonant clusters would first have those cluster undergo devoicing, resulting in a word like /azib-k/ to undergo devoicing [azipk] before epenthesis to [azipɛk]. Because epenthesis prevents this kind of devoicing from happening, we can say that epenthesis bleeds obstruent devoicing in consonant clusters.

(14) Bleeding Relationship:

a. What it is:

	/azib-k/	/ɛmid-fɔ/
$\emptyset \rightarrow \begin{bmatrix} + & \textsc{syl} \\ - & \textsc{tense} \\ - & \textsc{hi} \\ - & \textsc{low} \\ + & \textsc{front} \end{bmatrix} /\mathrm{C}\_\mathrm{C}\#$	[azibɛk]	—
$\begin{bmatrix} - & \textsc{son} \end{bmatrix} \rightarrow \begin{bmatrix} + & \textsc{voi} \end{bmatrix} /\_\begin{bmatrix} - & \textsc{son} \end{bmatrix}$	—	[ɛmitfɔ]

b. What could've been:

	/azib-k/	/ɛmid-fɔ/
$\begin{bmatrix} - & \textsc{son} \end{bmatrix} \rightarrow \begin{bmatrix} + & \textsc{voi} \end{bmatrix} /\_\begin{bmatrix} - & \textsc{son} \end{bmatrix}$	[azipk]	[ɛmitfɔ]
$\emptyset \rightarrow \begin{bmatrix} + & \textsc{syl} \\ - & \textsc{tense} \\ - & \textsc{hi} \\ - & \textsc{low} \\ + & \textsc{front} \end{bmatrix} /\mathrm{C}\_\mathrm{C}\#$	[azipɛk]	—

As an aside, (13c) and (13d) are very similar; it is tempting to want to collapse the two into a single rule. However, obstruents and word boundaries do not form a natural class. Another option would be to consider voiceless obstruents as the underlying form, which voice before sonorants (including vowels). This does not work however, as intervocalic voiceless obstruents do exist in this language, as in [ɔfpitɛ].