

Linguistics for Communication

Phonology
(2023/2024)

Lecturer

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PHONOLOGY

Phonology investigates the **organization** of speech sounds in a language.

Phonetics is concerned with the physical properties of speech sounds,
Phonology focuses on their **cognitive** and **functional** aspects,
considered in relation to a specific linguistic system.



How many distinct phones does a language have?
How many different **speech sounds** are there in English?

How many distinct phones does a language have?
How many different **speech sounds** are there in English?

The answer is not straightforward.

PHONOLOGY (3)

The pronunciation of a phone **varies** across different speakers and even within the same speaker:
there are slight **acoustic differences**.

Some of these differences are so subtle that they are **undetectable**,
while others can be perceived but are simply **ignored**.



Every phone is pronounced in an infinite number of different ways.
Every language has a potentially **unlimited number of phones**.

How can we **communicate** and **understand** each other if phones are so variable?

How can we **recognize** the words pronounced by others if the actual sounds that comprise them keep **varying**?

PHONEME

Phonemes are **mental constructs**.

They allow us to perceive multiple phones as a single linguistic unit, regardless of their different acoustic properties.



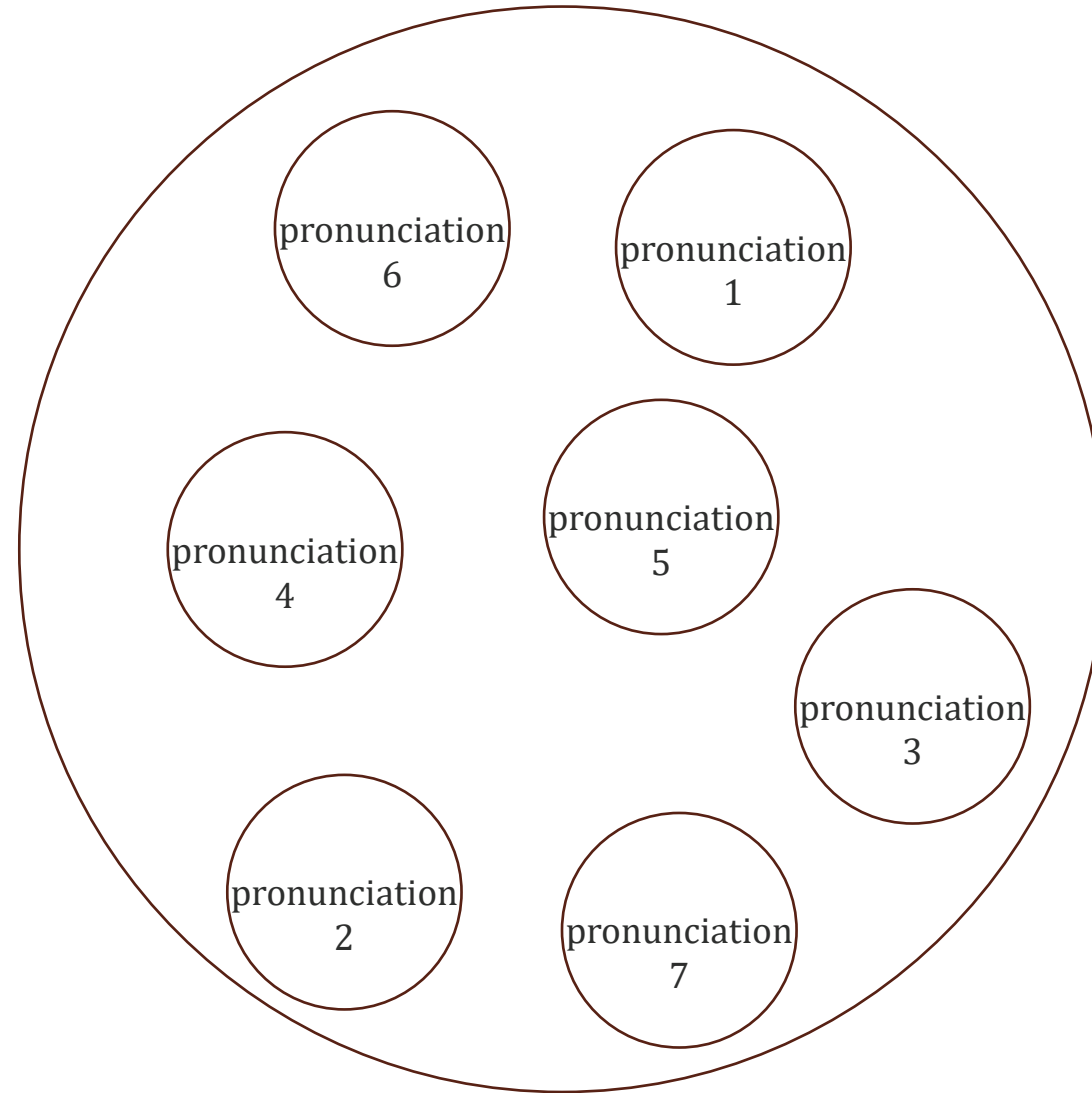
A phoneme is an abstraction that represents a set of speech sounds that are **functionally identical** in a certain language.

Allophones,
different realizations of a same phoneme.

PHONEME (2)

In **summary**:

a phoneme is a mental category that contains multiple allophones, which are phones (different pronunciations) that share enough similarities to be considered equivalent in a language.



PHONEME (3)

Phonemes are the smallest linguistic unit that can **distinguish** between words

Replacing one phoneme with another can change the meaning of a word.

voiced bilabial stop	[b]	[bæt] <i>bat</i>	} We obtain different words. /b/ and /k/ are different phonemes.
	↓	↓	
voiceless velar stop	[k]	[kæt] <i>cat</i>	
voiceless alveolar stop	[t]	['sɪtɪ] <i>city</i>	} The word doesn't change. [t] and [ɾ] are allophones of a same phoneme.
	↓	↓	
voiced alveolar tap	[ɾ]	['sɪɾɪ] <i>city</i>	

PHONEME (4)

Phonemes are the smallest linguistic unit that can **distinguish** between words

Replacing one phoneme with another can change the meaning of a word.

alveolar trill	[r]	['ra:na] rana 'frog'	} We obtain different words. /r/ and /l/ are different phonemes.
alveolar lateral	[l]	['la:na] lana 'wool'	
alveolar trill	[r]	['ra:na] rana 'frog'	} The word doesn't change. [r] and [ʀ] are allophones of a same phoneme.
uvular fricative	[ʀ]	['ʀa:na] rana 'frog'	

MINIMAL PAIR

One objective of Phonology is to determine which speech sounds of a language are allophones, and which ones are categorized under different phonemes.

Minimal pairs are used to identify phonemes



Pairs of words with **different meanings** that differ in **only one phone**.

E.g.	<i>pile</i>	vs	<i>tile</i>
	<i>bat</i>	vs	<i>cat</i>
	<i>lana</i>	vs	<i>rana</i>

MINIMAL PAIR (2)

Examine the following words and list all the **minimal pairs** you can find.
In addition, identify the **phonemes** involved by taking note
of which phonemes are swapped in each minimal pair.

Inuktitut, indigenous language of Canada. Broad transcription.

- | | |
|--|---------------------------------------|
| a. <i>iglumut</i> 'to a house' | h. <i>pin:a</i> 'that one up there' |
| b. <i>ukiaq</i> 'late fall' | i. <i>ani</i> 'female's brother' |
| c. <i>aiviq</i> 'walrus' | j. <i>iglu</i> '(snow)house' |
| d. <i>aniguvit</i> 'if you leave' | k. <i>pan:a</i> 'that place up there' |
| e. <i>aglu</i> 'seal's breathing hole' | l. <i>aivuq</i> 'she goes home' |
| f. <i>iglumit</i> 'from a house' | m. <i>ini</i> 'place, spot' |
| g. <i>anigavit</i> 'because you leave' | n. <i>ukiuq</i> 'winter' |

MINIMAL PAIR (2)

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pin:a 'that one up there' vs *pan:a* 'that place up there'
iglumut 'to a house' vs *iglumit* 'from a house'
ukiaq 'late fall' vs *ukiuq* 'winter'
ani 'female's brother' vs *ini* 'place, spot'
aiviq 'walrus' vs *aivuq* 'she goes home'
iglu '(snow)house' vs *aglu* 'seal's breathing hole'
aniguvit 'if you leave' vs *anigavit* 'because you leave'

/u/, /i/, and /a/ are distinct phonemes in Inuktitut:
replacing one with another creates a new word.

MINIMAL PAIR (3)

Examine the following words and list all the **minimal pairs** you can find.
In addition, identify the **phonemes** involved by taking note
of which phonemes are swapped in each minimal pair.

Tariana, a language spoken in Northwest Brazil. Broad transcription.

- a. *'keru* 'angry'
- b. *'yaw*i 'jaguar'
- c. *'lesa* 'boil'
- d. *'iri* 'blood'
- e. *'yavi* 'jaguar'
- f. *'keri* 'moon'
- g. *'ira* 'need'
- h. *'leka* 'break'

MINIMAL PAIR (3)

Examine the following words and list all the **minimal pairs** you can find.
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of which phonemes are swapped in each minimal pair.

Tariana, a language spoken in Northwest Brazil. Broad transcription.

' <i>keru</i> ' 'angry'	vs	' <i>keri</i> ' 'moon'	} /u/, /i/, /s/, /k/, and /a/ are distinct phonemes in Tariana: replacing one with another creates a new word.
' <i>lesa</i> ' 'boil'	vs	' <i>leka</i> ' 'break'	
' <i>iri</i> ' 'blood'	vs	' <i>ira</i> ' 'need'	
' <i>yawi</i> ' 'jaguar'	vs	' <i>yavi</i> ' 'jaguar'	is not a minimal pair: the meaning of the word doesn't change

Antico ‘ancient’

Invidia ‘envy’

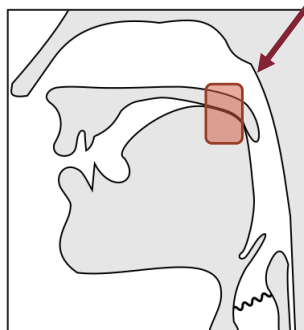
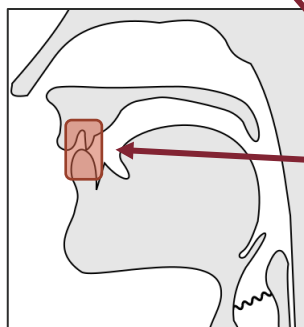
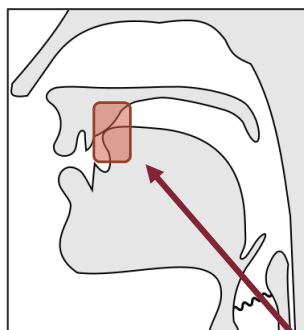
Angolo ‘angle’

COMPLEMENTARY DISTRIBUTION

Antico ‘ancient’ [an'ti:ko]

Invidia ‘envy’ [im'vi:dja]

Angolo ‘angle’ ['aŋgolo]



Different places of articulation

These phones are categorized under the same phoneme, and they cannot occur in the same context; thus, it's not possible to freely switch between them.

E.g. it's impossible to pronounce [am'ti:ko] instead of [an'ti:ko]

FREE VARIATION AND COMPLEMENTARY DISTRIBUTION

Free variation

The allophones are **interchangeable** in every context.



They can occur in the **same position** within a word, and can be swapped with each other without altering the word's meaning.

E.g. **English**

voiceless alveolar stop [t] and alveolar tap [ɾ]
['siti] ↔ ['siri]

Italian

alveolar trill [r] and voiced uvular fricative [ʀ]
['ʁa:na] ↔ ['ra:na]

Tariana

voiced labiodental fricative [v] and labio-velar approximant [w]
['yavi] ↔ ['yawɪ]

Complementary distribution

Each allophone is found in a **distinct phonetic context**.



They appear in **mutually exclusive** environments.

Complementary distribution is usually caused by the influence of neighboring speech sounds on the articulation of a phone

PHONEMES AND ALLOPHONES – EXERCISE 1

1. Identify the two allophones in complementary distribution: the labiodental nasal [m̥] and the velar nasal [ŋ]
2. Take note of the **context** in which each of them occurs
3. Based on your observations, deduce the **rules** that govern the distribution of the two allophones.

1. [im̥ventarjo] ‘inventory’
2. [fun̥go] ‘mushroom’
3. [aŋgolo] ‘angle’
4. [tron̥ko] ‘trunk’
5. [am̥fibjo] ‘amphibious’
6. [skom̥vɔlto] ‘shocked’
7. [am̥fora] ‘urn’
8. [iŋkavo] ‘cavity’

CONSONANTS (PULMONIC)											© 2020 IPA	
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal	
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ	
Nasal	m	m̥		n		ɳ	ɲ	ŋ	ɴ			
Trill	ʙ			r					ʀ			
Tap or Flap		ɸ		ɾ		ɽ						
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ	
Lateral fricative				ɬ ɮ								
Approximant		ʋ		ɹ		ɻ	j	ɰ				
Lateral approximant				l		ɭ	ʎ	ʟ				

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

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[m̥]

1. i _ v

5. a _ f

6. o _ v

7. a _ f

[ŋ]

2. u _ g

3. a _ g

4. o _ k

8. i _ k

the labiodental nasal occurs before labiodental consonants such as [f] and [v]
the velar nasal appears before velar consonants such as [k] and [g]

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Trill	ʙ			r					ʀ			
Tap or Flap		ɸ		ɾ		ɽ						
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ	
Lateral fricative				ɬ ɮ								
Approximant		ʋ		ɹ		ɻ	j	ɰ				
Lateral approximant				l		ɭ	ʎ	ʟ				

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[m̥] 1. _v

5. _f

6. _v

7. _f

[ŋ] 2. _g

3. _g

4. _k

8. _k

the labiodental nasal occurs before labiodental consonants such as [f] and [v]

the velar nasal appears before velar consonants such as [k] and [g]

the distribution of the allophones is determined by the **place of articulation** of the following consonant.

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	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal	
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Nasal	m	m̥		n		ɳ	ɲ	ŋ	ɴ			
Trill	ʙ			r					ʀ			
Tap or Flap		ɸ		ɾ		ɽ						
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ	
Lateral fricative				ɬ ɮ								
Approximant		ʋ		ɹ		ɻ	j	ɰ				
Lateral approximant				l		ɭ	ʎ	ʟ				

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PHONEMES AND ALLOPHONES – EXERCISE 2

Swahili, occurrences of [ɔ] and [o]. Broad transcription

ɲɔɔma ‘drum’

bɔɔma ‘fort’

ɲɔɔmbe ‘cattle’

ɔɔmba ‘pray’

ɔɔna ‘see’

pɔɔɲa ‘cure’

ɲɔɔɲa ‘nurse’

ɔɔɲdza ‘taste’

ɔɔɲgeza ‘increase’

ɲɔɔɲga ‘strangle’

karɔɔɲgo ‘wash-out’

k^hɔɔndo ‘sheep’

watoto ‘children’

ndoto ‘dream’

mboga ‘vegetable’

dzogo ‘rooster’

foka ‘axe’

okota ‘pick up’

modza ‘one’

mtego ‘trap’

Are they distinct phonemes
or allophones?

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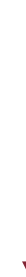
modza ‘one’

mtego ‘trap’

Are they distinct phonemes
or allophones?



No minimal pairs



Allophones

PHONEMES AND ALLOPHONES – EXERCISE 2

Swahili, occurrences of [ɔ] and [o]. Broad transcription

[ɔ]

g__m

b__m

ŋ__m

#__m

#__n

p__ɲ

ɲ__ɲ

#__ɲ

#__ŋ

r__ŋ

k^h__n

[o]

t__t

d__t

b__g

dʒ__g

ʃ__k

k__t

m__dʒ

g__#

d__#

#__k

t__#

Identify the contexts **preceding**
and following each vowel



before [ɔ]

before [o]

[g, b, ŋ, p, ɲ, r, k^h, #] [t, d, b, dʒ, ʃ, k, m, g, #]

partial overlap

after [ɔ]

after [o]

[m, n, ɲ, ŋ]

[t, g, k, dʒ, #]

mutually exclusive

PHONEMES AND ALLOPHONES – EXERCISE 2

Swahili, occurrences of [ɔ] and [o]. Broad transcription

[ɔ]

g__m

b__m

ŋ__m

#__m

#__n

p__ɲ

ɲ__ɲ

#__ɲ

#__ŋ

r__ŋ

k^h__n

[o]

t__t

d__t

b__g

dʒ__g

ʃ__k

k__t

m__dʒ

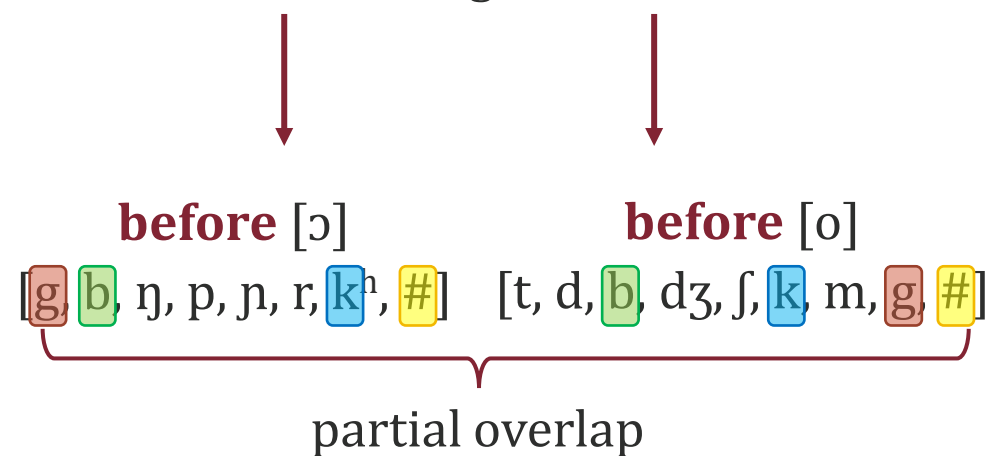
g__#

d__#

#__k

t__#

Identify the contexts **preceding**
and following each vowel



PHONEMES AND ALLOPHONES – EXERCISE 2

Swahili, occurrences of [ɔ] and [o]. Broad transcription

[ɔ]

g__m

b__m

ŋ__m

#__m

#__n

p__ɲ

ɲ__ɲ

#__ɲ

#__ŋ

r__ŋ

k^h__n

[o]

t__t

d__t

b__g

dʒ__g

ʃ__k

k__t

m__dʒ

g__#

d__#

#__k

t__#

Identify the contexts preceding
and **following** each vowel



after [ɔ]
[m, n, ɲ, ŋ]

after [o]
[t, g, k, dʒ, #]

mutually exclusive

PHONEMES AND ALLOPHONES – EXERCISE 2

Swahili, occurrences of [ɔ] and [o]. Broad transcription

[ɔ]

g__m

b__m

ŋ__m

#__m

#__n

p__ɲ

ɲ__ɲ

#__ɲ

#__ŋ

r__ŋ

k^h__n

[o]

t__t

d__t

b__g

dʒ__g

ʃ__k

k__t

m__dʒ

g__#

d__#

#__k

t__#

Do all the phones in a set of contexts share any **common characteristics**?



after [ɔ]

[m, n, ɲ, ŋ]



nasal consonants

after [o]

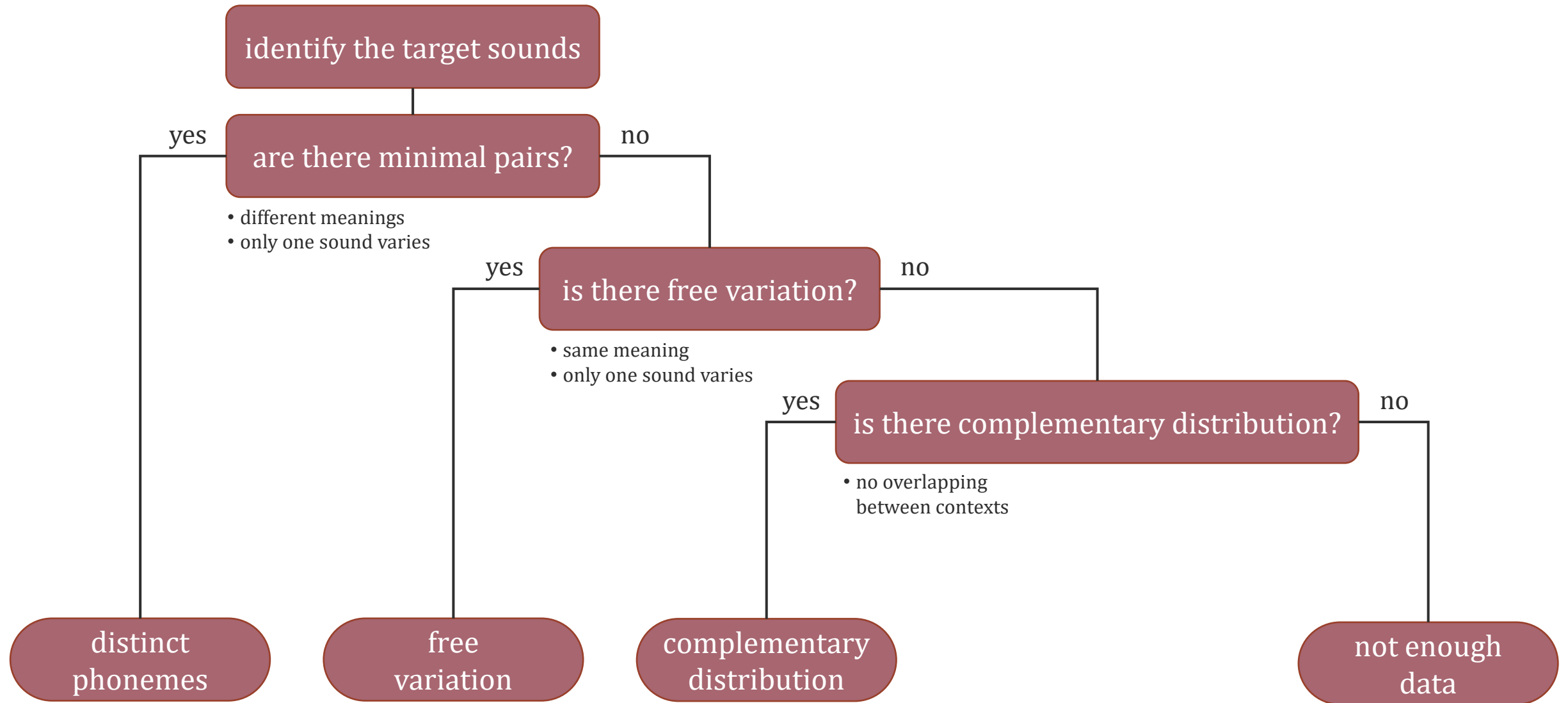
[t, g, k, dʒ, #]



[ɔ] occurs before nasal consonants

[o] occurs before non-nasal consonants
or at the end of a word

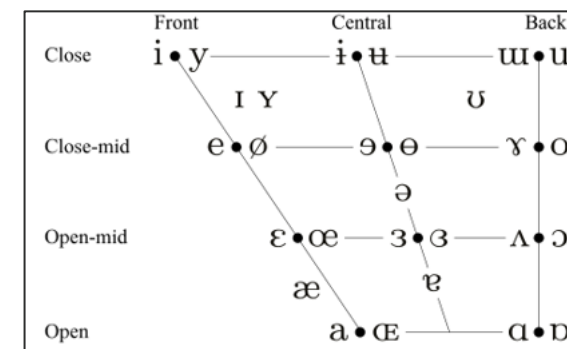
PHONEMIC ANALYSIS FLOWCHART



PHONEMES AND ALLOPHONES – EXERCISE 3

Examine the Kazakh data in the table below and determine whether [q] and [k] are separate phonemes or allophones; if they are allophones, determine if they are in free variation or in complementary distribution; if they are in complementary distribution, describe the contexts in which they occur.

[qoʃ] ‘welcome’	[qɑr] ‘snow’
[qət] ‘kick’	[køɫ] ‘lake’
[køʃ] ‘move’	[kir] ‘dirty’
[kʏt] ‘wait’	[kæri] ‘old’
[qotʉr] ‘pimples’	[qər] ‘go away’
[køpir] ‘bridge’	[kyriʃ] ‘rice’
[qol] ‘hand’	[qʉr] ‘hill’
[qatʃe] ‘mistake’	[kæsʃe] ‘cup’
[qəm] ‘sand’	[kyn] ‘sun’



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	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal		
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Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ				
Trill				r					ʀ				
Tap or Flap		ⱱ		ɾ		ɽ							
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ		
Lateral fricative				ɬ ɮ									
Approximant		ʋ		ɹ		ɻ	j	ɰ					
Lateral approximant				l		ɭ	ʎ	ʟ					

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

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[qoʃ] 'welcome'	[qɑr] 'snow'	[q] # _ o # _ ɐ # _ a # _ u	→	[q] and [k] are allophones in complementary distribution
[qɔt] 'kick'	[køɫ] 'lake'			
[køʃ] 'move'	[kir] 'dirty'			
[kyt] 'wait'	[kæri] 'old'			
[qotur] 'pimples'	[qɐr] 'go away'			
[køpir] 'bridge'	[kyrɨʃ] 'rice'	[k] # _ ø # _ y # _ i # _ æ	→	[q] occurs before back and central vowels [k] occurs before front vowels
[qol] 'hand'	[qur] 'hill'			
[qatʲe] 'mistake'	[kæsʲe] 'cup'			
[qəm] 'sand'	[kyn] 'sun'			

Why?