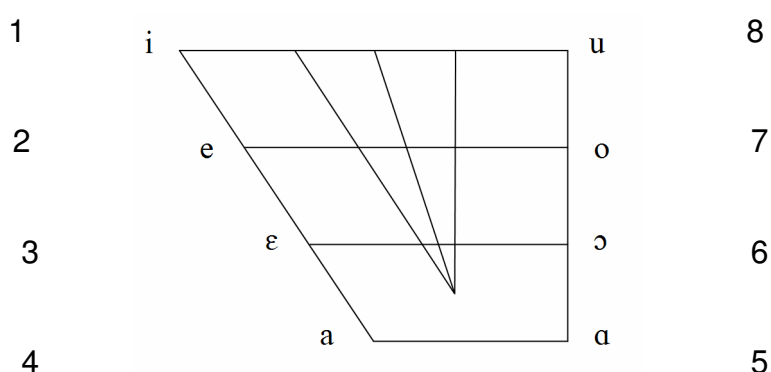


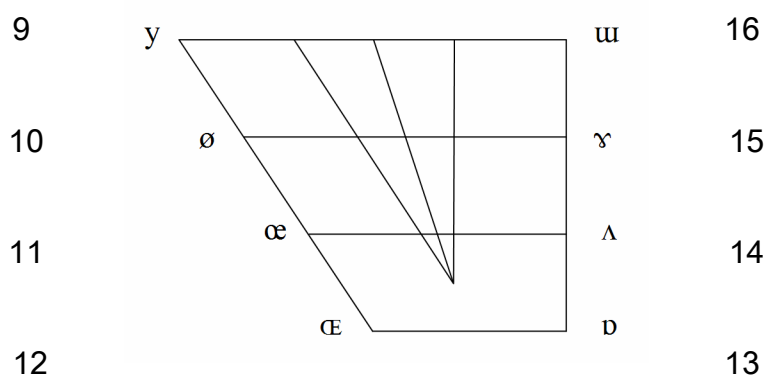
## Cardinal Vowels

Vowel quality can be judged against a set of language-independent, reference vowel qualities known as the **cardinal vowels**. These can be thought of as landmarks in the auditory space provided by the vowel quadrilateral. There are in fact two subsets of cardinal vowels: **primary** and **secondary**. The primary set [i e ε a ʊ o u], are numbered 1 - 8, (with 1 - 5 being **unrounded** and 6 - 8 **rounded**).



The primary cardinal vowels

The cardinal vowels are auditorily agreed qualities and must be learnt from a teacher who knows how they sound, or from a recording. However, vowels 1 and 5 can be given an articulatory specification. No.1 is produced with the frontest, closest position of the tongue which does not produce audible friction, and No. 5 is produced with the backest, openest possible tongue position, again without audible friction.



The secondary cardinal vowels

The **secondary** cardinal vowels are [y ø œ ɶ ɒ ʌ ɤ ɯ], numbered 9 - 16. The secondary cardinal vowels are related to the primary ones by reversing the lip-posture; so for example vowel 1 (primary) is close, front, *unrounded* and so vowel 9 (secondary) is close, front, *rounded*. To take another example, vowel 8 is close, back, *rounded* -- so vowel 16 is close, back, *unrounded*.