1 Drawing vowel diagrams

1.1 The `vowel` environment

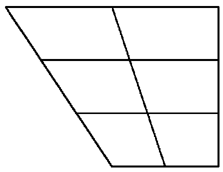
The general format of the `vowel` environment is as follows.

`\begin{vowel}[`*option*(,*option*,...)`]`
commands for inputting vowels
`\end{vowel}`

Options and commands for inputting vowels are explained below.

1.2 The shapes of the diagram supported

The default shape of the vowel diagram is the one used in the recent IPA chart, as shown below.



```
\begin{vowel}
\end{vowel}
```

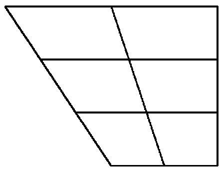
In this diagram, the bottom, back, and top sides are in the proportion 2:3:4, as was prescribed by Daniel Jones.

In order to change the shape of an diagram, specify the following options.

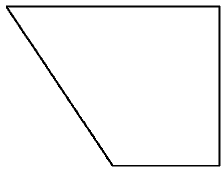
- `plain`, `simple`, `standard`, `ipanew` (=default)
- `rectangle` Draws a rectangular diagram.
- `triangle` Draws a triangular diagram.
- `three` Distinguishes only three levels of vowel height.

The first group of options are mutually exclusive, i.e. only one them can be selected at a time.

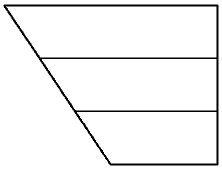
```
\begin{vowel}
\end{vowel}
```
or
```
\begin{vowel}[ipanew]
\end{vowel}
```



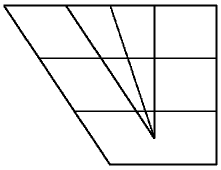
```
\begin{vowel}[plain]
\end{vowel}
```



```
\begin{vowel}[simple]
\end{vowel}
```

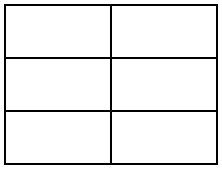


```
\begin{vowel}[standard]
\end{vowel}
```

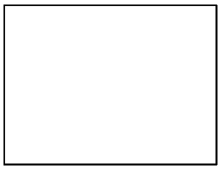


Among the other options, `rectangle` and `triangle` are mutually exclusive but each can be combined with one of the options `plain`, `simple` or `ipanew`. And the last option `three` can be combined with one of the options `plain`, `simple` or `ipanew`, and with one of the options `rectangle` and `triangle`.

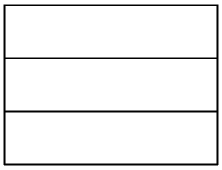
```
\begin{vowel}[rectangle]
\end{vowel}
```



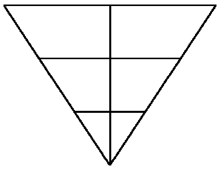
```
\begin{vowel}[plain,rectangle]
\end{vowel}
```



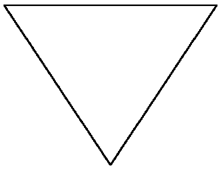
```
\begin{vowel}[simple,rectangle]
\end{vowel}
```



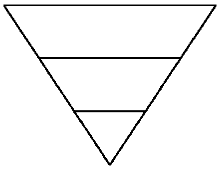
```
\begin{vowel}[triangle]
\end{vowel}
```



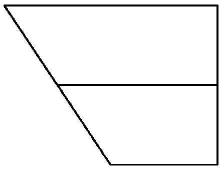
```
\begin{vowel}[plain,triangle]
\end{vowel}
```



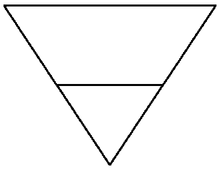
```
\begin{vowel}[simple,triangle]
\end{vowel}
```



```
\begin{vowel}[simple,three]
\end{vowel}
```



```
\begin{vowel}[simple,triangle,three]
\end{vowel}
```



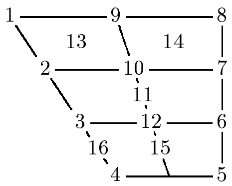
1.3 Placing vowels on a diagram

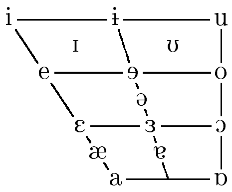
The following commands are prepared in order to place vowels in the vowel diagram.

- `\putcvowel[l|r]{symbol}{`*cardinal position*`}`
- `\putvowel[l|r]{symbol}{x}{y}`

The former command is used to place a vowel on a *cardinal postion*, and the latter is used to place a vowel on a point specified by x and y. In each case, an optional argument `[l]` or `[r]` can be given, which specifies to put a symbol (usually a dot) that indicates the point and a vowel is placed at the left or right of the symbol.

The next table shows a diagram indicating the cardinal positions and an example of a vowel diagram containing the `\putcvowel` commands.





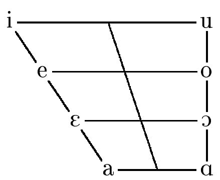

```
\begin{vowel}
  \putcvowel{i}{1}
  \putcvowel{e}{2}
  \putcvowel{\textipa{E}}{3}
  \putcvowel{a}{4}
  ...
\end{vowel}
```

The cardinal positions from 1 through 8 are the same with the numbers of cardinal vowels determined by Daniel Jones. And the remaining numbers (from 9 through 16) are extended cardinal positions that are used to indicate the positions of all the remaining vowels that appear in the recent IPA chart, having no relation to the Jonesian system of cardinal vowels.

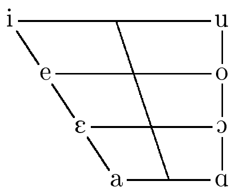
1.4 Chnaging the size of a diagram

The usual commands for changing the size of text fonts such as `\small`, `\large`, `\Large`, etc. can be used to change the size of a vowel diagram.

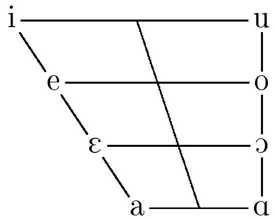
```
{\small
\begin{vowel}
\putcvowel{i}{1}
...
\end{vowel}}
```




```
\begin{vowel}
\putcvowel{i}{1}
...
\end{vowel}
```



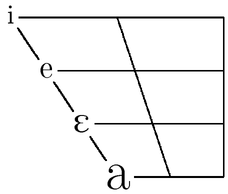

```
{\large
\begin{vowel}
\putcvowel{i}{1}
...
\end{vowel}}
```



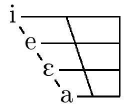
It is also possible to change the size of a vowel symbol and the size of a diagram independently.

In order to change only the size of a vowel symbol, use the commands such as `\small`, `\large`, etc. within the `\putcvowel` command.

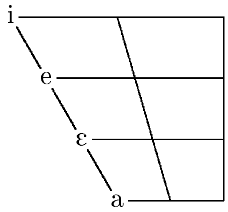
And in order to change only the size of a diagram, give appropriate values to the parameters `\vowelhunit` and `\vowelvunit`. `\vowelhunit` stands for the horizontal unit length, and `\vowelvunit` the vertical unit length. By default both `\vowelhunit` and `\vowelvunit` are equal to 2em. And if only the former is modified by an user, the latter is automatically adjusted to the same length.




```
\begin{vowel}
\putcvowel{i}{1}
\putcvowel{\large e}{2}
\putcvowel{\Large\textipa{E}}{3}
\putcvowel{\huge a}{4}
\end{vowel}
```



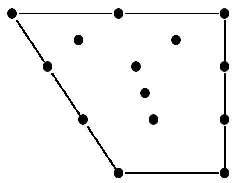

```
{\vowelhunit=1em
\begin{vowel}
\putcvowel{i}{1}
...
\end{vowel}}
```

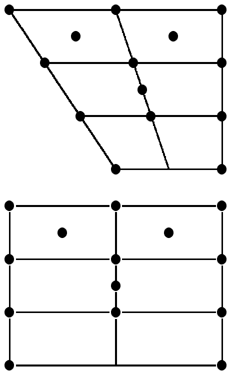



```
{\vowelvunit=2.31em
\begin{vowel}
\putcvowel{i}{1}
...
\end{vowel}}
```

In the later works of Daniel Jones, it is reported that he had used such a diagram that the angle of the upper-left corner is 60 degrees. In this case, the bottom, right, and top sides are in the proportion of $2{:}\sqrt{12}{:}4$.

This is the following paragraph. This is the following paragraph. This is the following paragraph. This is the following paragraph. This is the preceding paragraph. This is the preceding paragraph. This is the preceding paragraph. This is the preceding paragraph.





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