

HUMBOLDT-UNIVERSITÄT ZU BERLIN



## L<sup>A</sup>T<sub>E</sub>X for Linguists

L<sup>4</sup> 08: Venn diagram, vowel diagram, sonority profile & tables 2

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## Reader

**L<sup>A</sup>T<sub>E</sub>X Reader** (Freitag & Machicao y Priemer 2019):  
<https://doi.org/10.13140/RG.2.2.29299.27682>

**Exercises and Handouts:**  
<https://www.linguistik.hu-berlin.de/de/staff/amyp/latex>

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## Venn diagram

Venn diagrams can be drawn with the **tikz package**. It is quite **complex**, but the results are **perfect**. Mostly you can find the code for what you are trying to draw on the internet.

An easier way to draw Venn diagrams is using the **venndiagram package**. It is based on TikZ, but it has fewer options.

## Drawing with TikZ

```
\begin{tikzpicture}
\begin{scope}[blend group=soft light]
\fill[red!40!white]
(90:1.2) circle (2);
\fill[green!40!white]
(210:1.2) circle (2);
\fill[blue!40!white]
(330:1.2) circle (2);
\end{scope}

\node at (90:2) {A};
\node at (210:2) {B};
\node at (330:2) {C};

\end{tikzpicture}
```

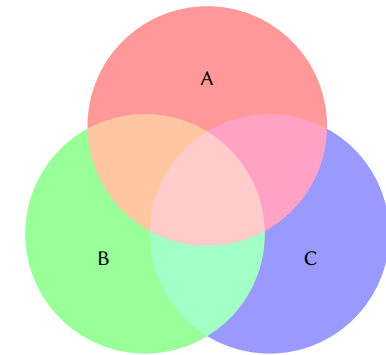


Figure 1: Venn diagram

```
\begin{tikzpicture}
\def\firstrectangle{(0,0) rectangle (6,4)}
\def\firstcircle{(3,2) circle (1.5cm)}
\def\secondcircle{(0:2cm) circle (1.5cm)}

\begin{scope}[shift={(-3cm,2cm)}]
\clip \firstrectangle;
\fill[yellow] \firstrectangle;
\fill[white] \firstcircle;
\end{scope}

\begin{scope}[shift={(-3cm,2cm)}]
\draw \firstcircle;
\draw \firstrectangle;
\node at (33:6.8) {U};
\node at (60:4) {A};
\node at (40:4) {2};
\node at (30:3) {3};
\node at (17:4) {1};
\node at (50:4) {4};
\node at (27:4.5) {5};
\node at (6.9:2.3) {natural numbers without 1-5};
\end{scope}

\end{tikzpicture}
```

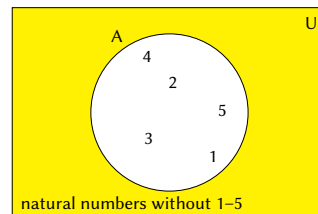


Figure 2: Universe minus set

```
\begin{tikzpicture}
\def\firstellipse{(0,0) ellipse (1.3cm and 1.7cm)}
\def\secondellipse{(3.4,0) ellipse (1.3cm and 1.7cm)}
\begin{scope}
\draw \firstellipse ;
\draw \secondellipse ;
\node at (90:-2.25) {\textsc{dom}(f)};
\node at (90:1.25) {\blue{Lisa}};
\node at (90:.75) {\blue{Leia}};
\node at (90:.25) {\blue{Luke}};
\node at (90:-.25) {\blue{A. Merkel}};
\node at (90:-.75) {\blue{Friedrich II.}};
\node at (3.4,-2.25) {\textsc{rng}(f)};
\node at (3.4,1.25) {\alert{Homer}};
\node at (3.4,.75) {\alert{Vader}};
\node at (3.4,.25) {\alert{H. Kasner}};
\node at (3.4,-.25) {\alert{Friedrich I.}};
\node at (3.4,-.75) {\alert{Lex Luthor}};
\draw[thick,->] (.5,1.25) -- (2.8,1.25);
\draw[thick,->] (.5,.75) -- (2.8,.75);
\draw[thick,->] (.5,.25) -- (2.8,.75);
\draw[thick,->] (.9,-.25) -- (2.5,.25);
\draw[thick,->] (.9,-.75) -- (2.5,-.25);
\end{scope}
\end{tikzpicture}
```

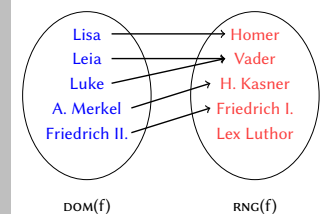


Figure 3: Function *father of*

## Exercise

- Copy the following code into your document.

```
\begin{tikzpicture}

\begin{scope}[blend group=soft light]
\fill[red!40!white]
(90:1.2) circle (2);
\fill[green!40!white]
(210:1.2) circle (2);
\fill[blue!40!white]
(330:1.2) circle (2);
\end{scope}

\node at (90:2) {A};
\node at (210:2) {B};
\node at (330:2) {C};

\end{tikzpicture}
```

- Change the names A, B, and C in the sets.
- Add (a node) D to the green set, E to the pink set and F to the violet set.
- Try to change a bit the colour of the sets.

## Drawing with venndiagram

Load the package:

```
\usepackage{venndiagram}
```

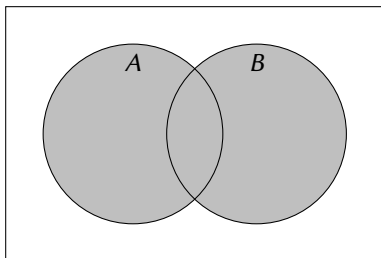
This package defines two environments:

- Venn diagrams with **two sets**
- Venn diagrams with **three sets**

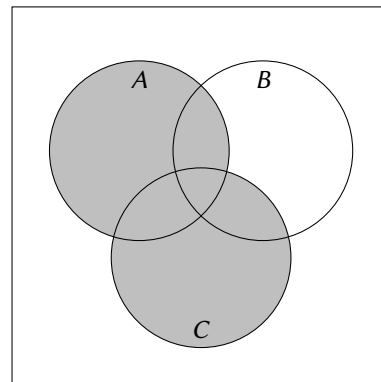
```
\begin{venndiagram2sets}
\end{venndiagram2sets}
```

```
\begin{venndiagram3sets}
\end{venndiagram3sets}
```

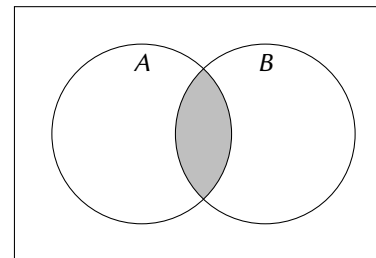
```
\begin{venndiagram2sets}
\fillA \fillB
\end{venndiagram2sets}
```



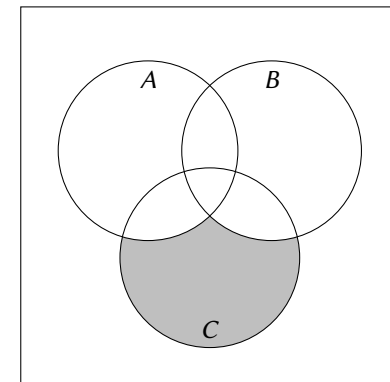
```
\begin{venndiagram3sets}
\fillA \fillC
\end{venndiagram2sets}
```



```
\begin{venndiagram2sets}
\fillACapB
\end{venndiagram2sets}
```

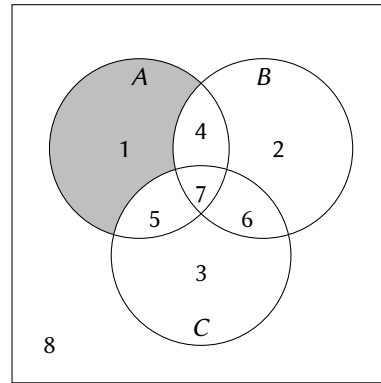


```
\begin{venndiagram3sets}
\fillOnlyC
\end{venndiagram3sets}
```



Elements of the sets are given as options to the environment.

```
\begin{venndiagram3sets}[  
  labelOnlyA={1},  
  labelOnlyB={2},  
  labelOnlyC={3},  
  labelOnlyAB={4},  
  labelOnlyAC={5},  
  labelOnlyBC={6},  
  labelABC={7},  
  labelNotABC={8}  
]  
  
\fillOnlyA  
\end{venndiagram3sets}
```



## Further features

- For further features, check the package documentation (Talbot 2016).
- For complex diagrams, it is recommendable to use TikZ.

## Exercise

- Load the package `venndiagram`.
- Replicate the following figure.

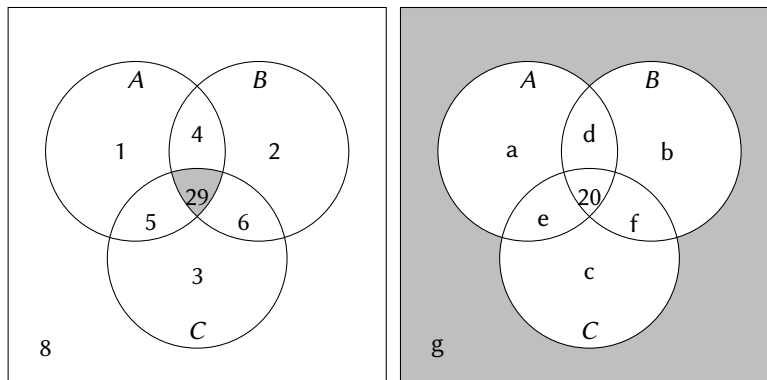


Figure 4: Two venn diagrams in *figure* environment

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# Vowel diagram

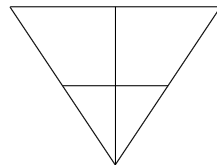
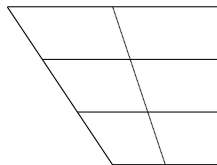
Load the package vowel (it works with the package tipa):

```
\usepackage{vowel}
```

Vowel provides a vowel environment with different options:

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

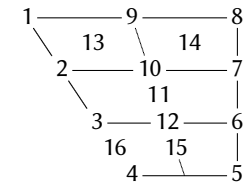
```
\begin{vowel}[triangle,three]
\end{vowel}
```



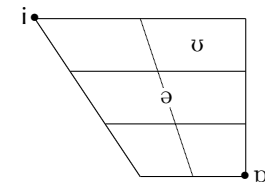
Vowels can be included with the command `putcvowel`.

```
\putcvowel[l|r]{x}{y}
```

- **Options:**  
 l or r → left or right of a specified point (y) in the diagram
- **Arguments:**  
 x → IPA symbol  
 y → specified position in the diagram (every position in the diagram has a number!)



```
\begin{vowel}
\putcvowel[l]{i}{1}
\putcvowel[r]{\textscripta}{5}
\putcvowel{\textschwa}{11}
\putcvowel{\textupsilon}{14}
\end{vowel}
```

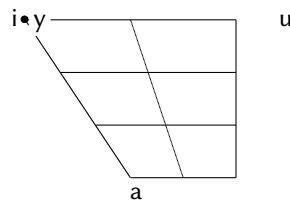


Vowels can be included with the command `putvowel`.

```
\putvowel[l|r]{x}{z}{w}
```

- **Options:**  
 l or r → left or right of a node specified by the coordinates z and w
- **Arguments:**  
 x → IPA symbol  
 z → coordinate on x axis  
 w → coordinate on y axis

```
\begin{vowel}
\putvowel[l]{i}{0pt}{0pt}
\putvowel[r]{y}{0pt}{0pt}
\putvowel{a}{42pt}{66pt}
\putvowel{u}{99pt}{0pt}
\end{vowel}
```



```
\begin{vowel}
\putcvowel[l]{\textipa{i}}{1}
\putcvowel[r]{\textipa{y}}{1}
\putcvowel[l]{e}{2}
\putcvowel[r]{o}{2}
\putcvowel[l]{\textepsilon}{3}
\putcvowel[r]{\textoe}{3}
\putcvowel[l]{a}{4}
\putcvowel[r]{\textscelig}{4}
\putcvowel[l]{\textscripta}{5}
\putcvowel[r]{\textturnscripta}{5}
\putcvowel[l]{\textturnv}{6}
\putcvowel[r]{\textopeno}{6}
\putcvowel[l]{\textramshorns}{7}
\putcvowel[r]{o}{7}
\putcvowel[l]{\textturnm}{8}
\putcvowel[r]{u}{8}
\putcvowel[l]{\textbari}{9}
\putcvowel[r]{\textbaru}{9}
\putcvowel[l]{\textreve}{10}
\putcvowel[r]{\textbaro}{10}
\putcvowel{\textschwa}{11}
\putcvowel[l]{\textrepepsilon}{12}
\putcvowel[r]{\textclosevepsilon}{12}
```

```
\putcvowel{\textsci} \textscy}{13}
\putcvowel{\textupsilon}{14}
\putcvowel{\texturna}{15}
\putcvowel{\textae}{16}
\end{vowel}
```

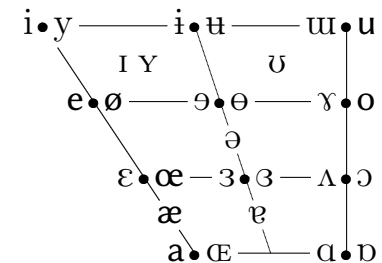


Figure 5: Vowel diagram

## Exercise

- Load the package vowel.
- Replicate the following figure.

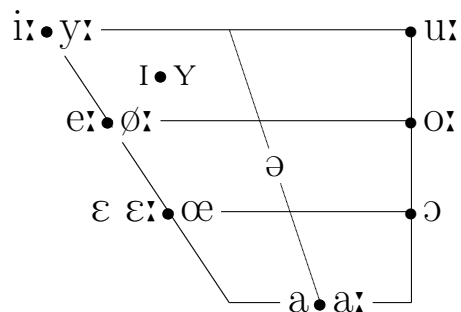


Figure 6: Vowel diagram in *figure* environment

## Further features

Check the documentation (Rei 2001) for more features.

Check also Felix Kopecky's solution (for Language Science Press) with TikZ: <http://userblogs.fu-berlin.de/langsci-press/2016/06/15/drawing-vowel-charts-with-tikz/>

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## Sonority profiles

```

\begin{tikzpicture}[scale=.5]
\draw[black] (-1,0)--(6.5,0); % x axis
\draw[black] (-1,0)--(-1,6.5); % y axis

\node at (-2.5,6) {vowel};
\node at (-2.5,5) {\textipa{/textscr/}};
\node at (-2.5,4) {\textipa{/l/}};
\node at (-2.5,3) {nasal};
\node at (-2.5,2) {fricative};
\node at (-2.5,1) {plosive};

\draw[black] (0,2)--(1,1)--(2,5)--(3,6)
--(4,2);
\node at (0,-1) {\strut \textipa{/S/}};
\node at (1,-1) {\strut \textipa{/p/}};
\node at (2,-1) {\strut \textipa{/textscr/}};
\node at (3,-1) {\strut \textipa{/I/}};
\node at (4,-1) {\strut \textipa{/c/}};

\fill (0,2) circle [radius=3pt];
\fill (1,1) circle [radius=3pt];
\fill (2,5) circle [radius=3pt];
\fill (3,6) circle [radius=3pt];

```

```

\fill (4,2) circle [radius=3pt];
\end{tikzpicture}

```

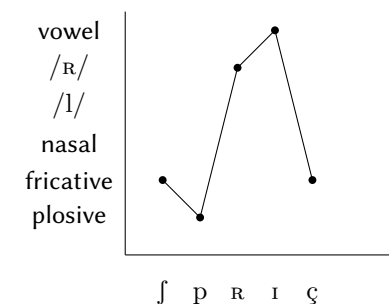


Figure 7: Sonority profile with TikZ

You can do lots of things with TikZ, but normally you can **just copy the code**, because somebody else already did it.

```
\newcommand{\shrug}[1] [] {%
\begin{tikzpicture}[baseline,x=0.8\ht\strutbox,y=0.8\ht\strutbox,line width=0.125ex,#1]
\def\arm{(-2.5,0.95) to (-2,0.95) (-1.9,1) to (-1.5,0) (-1.35,0) to (-0.8,0)};
\draw \arm;
\draw[xscale=-1] \arm;
\def\headpart{(0.6,0) arc[start angle=-40, end angle=40,x radius=0.6,y radius=0.8]};
\draw \headpart;
\draw[xscale=-1] \headpart;
\def\eye{(-0.075,0.15) .. controls (0.02,0) .. (0.075,-0.15)};
\draw[shift={(-0.3,0.8)}] \eye;
\draw[shift={(0,0.85)}] \eye;
% draw mouth
\draw (-0.1,0.2) to [out=15,in=-100] (0.4,0.95);
\end{tikzpicture}}
```

For instance:

```
\shrug or \shrug[x=1ex,y=1ex,blue]
```

For instance:

```
\_('\_)/ or \_('\_)
```

## Exercise

- Copy the following code for a sonority profile and change it.

```
\begin{tikzpicture}[scale=.5]
\draw[black] (-1,0)--(6.5,0); % x axis
\draw[black] (-1,0)--(-1,6.5); % y axis

\node at (-2.5,6) {vowel};
\node at (-2.5,5) {\textipa{/textschr/}};
\node at (-2.5,4) {\textipa{/l/}};
\node at (-2.5,3) {nasal};
\node at (-2.5,2) {fricative};
\node at (-2.5,1) {plosive};

\draw[black] (0,2)--(1,1)--(2,5)--(3,6)--(4,2);
\node at (0,-1) {\strut \textipa{s}};
\node at (1,-1) {\strut \textipa{p}};
\node at (2,-1) {\strut \textipa{textscr}};
\node at (3,-1) {\strut \textipa{l}};
\node at (4,-1) {\strut \textipa{c}};

\fill (0,2) circle [radius=3pt];
\fill (1,1) circle [radius=3pt];
\fill (2,5) circle [radius=3pt];
\fill (3,6) circle [radius=3pt];
\fill (4,2) circle [radius=3pt];
\end{tikzpicture}
```

## Exercise

- Copy the code for the shrug command (put it where you have your own commands) and use it in your document.

```
\newcommand{\shrug}[1] [] {%
\begin{tikzpicture}[baseline,x=0.8\ht\strutbox,y=0.8\ht\strutbox,line width=0.125ex,#1]
\def\arm{(-2.5,0.95) to (-2,0.95) (-1.9,1) to (-1.5,0) (-1.35,0) to (-0.8,0)};
\draw \arm;
\draw[xscale=-1] \arm;
\def\headpart{(0.6,0) arc[start angle=-40, end angle=40,x radius=0.6,y radius=0.8]};
\draw \headpart;
\draw[xscale=-1] \headpart;
\def\eye{(-0.075,0.15) .. controls (0.02,0) .. (0.075,-0.15)};
\draw[shift={(-0.3,0.8)}] \eye;
\draw[shift={(0,0.85)}] \eye;
% draw mouth
\draw (-0.1,0.2) to [out=15,in=-100] (0.4,0.95);
\end{tikzpicture}}
```

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## Tables 2

Two more helpful commands for tables:

- With `\multicolumn{number of cols}{alignment}{text}`, text can occupy more than one column.
- With `\cline{cell number - cell number}`, you can have horizontal lines specifying its begin (cell number) and end (cell number).

```
\begin{tabular}[t]{lrr}
\multicolumn{2}{c}{Item} & \\
\cline{1-2}
article & unit & price \\
\hline
proofreading & per words & 0.02 \\
layout & per page & 0.80 \\
printing & per page & 0.99 \\
typesetting & per article & 40.33 \\
\end{tabular}
```

Item		
article	unit	price
proofreading	per words	0.02
layout	per page	0.80
printing	per page	0.99
typesetting	per article	40.33

The package `tabularx` provides

- an extra **argument** to **specify the width** of the table, and
- a new column specifier `X`; the `X`-columns will be **stretched** until the table is as wide as specified.

The package `booktabs` provides `\toprule`, `\bottomrule`, `\midrule`, and `\cmidrule{x-y}` which are versions of `\hline` and `\cline{x-y}` with better spacing.

The package `multirow` gives you the possibility to merge cells vertically.

```
\begin{tabularx}{.4\textwidth}{XXX}
\toprule
0001 & 002 & 03 \\
\midrule
0A & Bii & 000C \\
\cmidrule{1-1}\cmidrule{3-3}
00i & & 000iii \\
\bottomrule
\end{tabularx}
```

0001	002	03
0A	Bii	000C
00i		000iii

You can find further packages and commands for tables on:  
<https://en.wikibooks.org/wiki/LaTeX/Tables>

## Exercise

- Create a centered 4x4 tabular (1,2,3,4),(5,6,7,8),(9,10,11,12),(13,14,15,16)
- Change the column definition to `l` and `r`.
- Change one column definition to `p{.75cm}`
- Add some empty lines.
- Adjust vertical spacing between lines with `\[2.5mm]`

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16



## Exercise

- Put your tabular in a table environment.
- Add a caption and a label.
- Add an additional tabular within the same table environment
- Use `-` to adjust the spacing between the two tabulars.
- Try `\centering` after the begin of the environment.

1	2	3	4	1	2	3	4
5	6	7	8	5	6	7	8
9	10	11	12	9	10	11	12
13	14	15	16	13	14	15	16

Table 1: Exercise table

## Exercise

- Load the package `tabularx`.
- Add a new table `\begin{tabularx}{\textwidth}{llll}` with the same content as above.
- Vary the column definitions between `l`, `r`, `c`, and `X`.
- Vary the width of the tabular, e.g. `0.66\textwidth`
- Remove one `l` from one of your tabular column definitions. Recompile. Fix it.
- Add additional `ls` to one of your tabular definitions. Recompile. Fix it.
- Enclose the content of the first cell of the last row in `[ ]`. Fix it.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Table 2: Exercise table

## Exercise

- Load the package `booktabs`.
- Add `\toprule`, `\midrule`, `\bottomrule` to your tabulars.  
Note: typographers suggest that lines in tables should be limited to a minimum.
- Replace some `\midrules` by `\hlines` and inspect the difference.
- Use `\multicol{2}{c}{content for merged cell}` in one of your tables.
- Use `\multicol{2}{l}{content for merged cell}` in one of your tables.
- Use `\multicol{2}{r}{content for merged cell}` in one of your tables.
- Load the package `multirow`.
- Use `\multirow{2}{*}{content for merged cell}` in one of your tables.

1	2	3	4
5	6	7	8
multirow	10	11	12
	14	15	16

Table 3: Exercise table

## Internet sources I

- Link: Drawing vowel charts with TikZ – Felix Kopecky.  
<https://userblogs.fu-berlin.de/langsci-press/2016/06/15/drawing-vowel-charts-with-tikz/>  
[Access: 08/12/2018]
- Link: Language Science Press  
[www.langsci-press.org](http://www.langsci-press.org)  
[Access: 02/01/2019]
- Link: LaTeX Coffee Stains – Hanno Rein.  
<http://hanno-rein.de/downloads/coffee.pdf>  
[Access: 12/01/2019]
- Link: LaTeX/Special Characters  
[https://en.wikibooks.org/wiki/LaTeX/Special\\_Characters](https://en.wikibooks.org/wiki/LaTeX/Special_Characters)  
[Access: 02/01/2019]
- Link: TeX – LaTeX Stack Exchange: Typeset the shrug emoji  
<https://tex.stackexchange.com/q/279100>  
[Access: 16/01/2019]
- Link: Wikibooks: LaTeX/Tables  
<https://en.wikibooks.org/wiki/LaTeX/Tables>  
[Access: 16/01/2019]
- Link: Type IPA phonetic symbols.  
<http://ipa.typeit.org/full/>  
[Access: 02/01/2019]

# Literature I

- Freitag, Constantin & Antonio Machicao y Priemer. 2019. LaTeX-Einführung für Linguisten. Manuscript. <https://doi.org/10.13140/RG.2.2.29299.27682>.
- Knuth, Donald E. 1986. *The TeX book*. Boston, MA: Addison-Wesley.
- Kopka, Helmut. 1994. *LaTeX: Einführung*, vol. 1. Bonn: Addison-Wesley.
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