LaTeX for Linguists

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Contents

Chapter 1

LaTeX: A Beginner's Tutorial

1.1 Why LaTeX?

LaTeX: No sex, but still sexy
LaTeX is a software system for typesetting that is based on the typesetting system TeX.

As a typesetting program it is a true alternative to office programs such as Open Office, Microsoft Office etc.

LaTeX is especially useful for writing longer, scientific papers.

LaTeX: pros and cons
Pros LaTeX:

- stable
- great compatibility with all operating systems
- precise depiction of formulas
- excellent typesetting quality
- a lot of automatic repairs (e.g. no double spaces)
- very powerful: you can define your own formatting

Cons LaTeX:

- not as intuitive as Office programs
- requires more time to learn in the beginning
- modification of the standard layout is complicated

"Word" or LaTeX?

Wer reitet so spät durch Nacht und Wind?
Es ist der Vater mit seinem Kind;
Er hat den Knaben wohl in dem Arm,
Er faßt ihn sicher, er hält ihn warm.

Mein Sohn, was birgst du so bang dein Gesicht? -
Siehst Vater, du den Erlkönig nicht?
Den Erlenkönig mit Kron und Schweif? -
Mein Sohn, es ist ein Nebelstreif. -

"Du liebes Kind, komm, geh mit mir!
Gar schöne Spiele spiel ich mit dir;
Manch bunte Blumen sind an dem Strand,
Meine Mutter hat manch gülden Gewand."

Mein Vater, mein Vater, und hörest du nicht,
Was Erlenkönig mir leise verspricht? -
Sei ruhig, bleibe ruhig, mein Kind;
In dürren Blättern säuselt der Wind. -

"Willst, feiner Knabe, du mit mir gehn?
Meine Töchter sollen dich warten schön;
Meine Töchter führen den nächtlichen Reihn
Und wiegen und tanzen und singen dich ein."

Mein Vater, mein Vater, und siehst du nicht dort
Erlkönigs Töchter am düstern Ort? -
Mein Sohn, mein Sohn, ich seh es genau:
Es scheinen die alten Weiden so grau. -

"Ich liebe dich, mich reizt deine schöne Gestalt;
Und bist du nicht willig, so brauch ich Gewalt."
Mein Vater, mein Vater, jetzt faßt er mich an!
Erlkönig hat mir ein Leids getan! -

Dem Vater grauset's, er reitet geschwind,
Er hält in den Armen das ächzende Kind,
Erreicht den Hof mit Mühe und Not;
In seinen Armen das Kind war tot.

Wer reitet so spät durch Nacht und Wind?
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In seinen Armen das Kind war tot.

Ich bin geboren zu York im Jahre 1632, als Kind angesehener Leute, die ursprünglich nicht aus jener Gegend stammten. Mein Vater, ein Ausländer, aus Bremen gebürtig, hatte sich zuerst in Hull niedergelassen, war dort als Kaufmann zu hübschem Vermögen gekommen und dann, nachdem er sein Geschäft aufgegeben hatte, nach York gezogen. Hier heirathete er meine Mutter, eine geborene Robinson. Nach der geachteten Familie, welcher sie angehörte, wurde ich Robinson Kreuznaer genannt. In England aber ist es Mode, die Worte zu verunstalten, und so heißen wir jetzt Crusoe, nennen und schreiben uns sogar selbst so, und diesen Namen habe auch ich von jeher unter meinen Bekannten geführt.

Ich hatte zwei ältere Brüder. Der eine von ihnen, welcher als Oberstleutenant bei einem englischen, früher von dem berühmten Oberst Lockhart befehligten Infanterieregiment in Flandern diente, fiel in der Schlacht bei Dünkirchen. Was aus dem jüngeren geworden ist, habe ich ebensowenig in Erfahrung bringen können, als meine Eltern je Kenntniß von meinen eignen Schicksalen erhalten haben.

Schon in meiner frühen Jugend steckte mir der Kopf voll von Plänen zu einem umherschweifenden Leben. Mein bereits bejahrter Vater hatte mich so viel lernen lassen, als durch die Erziehung im Hause und den Besuch einer Freischule auf dem Lande möglich ist. Ich war für das Studium der Rechtsgelehrsamkeit bestimmt. Kein anderer Gedanke aber in Bezug auf meinen künftigen Beruf wollte mir behagen als der, Seemann zu werden. Dieses Vorhaben brachte mich in schroffen Gegensatz zu den Wünschen und Befehlen meines Vaters und dem Zureden meiner Mutter, wie auch sonstiger mir freundlich gesinnter Menschen. Es schien, als habe das Schicksal in meine Natur einen unwiderstehlichen Drang gelegt, der mich gerades Wegs in künftiges Elend treiben sollte.

Mein Vater, der ein verständiger und ernster Mann war, durchschaute meine Pläne und suchte mich durch eindringliche Gegenvorstellungen von denselben abzubringen. Eines Morgens ließ er mich in sein Zimmer, das er wegen der Gicht hüten mußte, kommen und sprach sich über jene Angelegenheit mit großer Wärme gegen mich aus. "Was für andere Gründe", sagte er, "als die bloße Vorliebe für ein unstetes Leben, können dich bewegen, Vaterhaus und Heimat verlassen zu wollen, wo du dein gutes Unterkommen hast und bei Fleiß und Ausdauer in ruhigem und behaglichem Leben dein Glück machen kannst. Nur Leute in verzweifelter Lage, oder solche, die nach großen Dingen streben, gehen außer Landes auf Abenteuer aus, um sich durch Unternehmungen empor zu bringen und berühmt zu machen, die außerhalb der gewöhnlichen Bahn liegen. Solche Unternehmungen aber sind für dich entweder zu hoch oder zu gering. Du gehörst in den Mittelstand, in die Sphäre, welche man die höhere Region des gemeinen Lebens nennen könnte. Die aber ist, wie mich lange Erfahrung gelehrt hat, die beste in der Welt; in ihr gelangt man am sichersten zu irdischem Glück. Sie ist weder dem Elend und der Mühsal der nur von Händearbeit lebenden Menschenklasse ausgesetzt, noch wird sie von dem Hochmuth, der Ueppigkeit, dem Ehrgeiz und dem Neid, die in den höheren Sphären der Menschenwelt zu Hause sind, heimgesucht."

"Am besten", fügte er hinzu, "kannst du die Glückseligkeit des Mittelstandes daraus erkennen, daß er von Allen, die ihm nicht angehören, beneidet wird. Selbst Könige haben oft über die Mißlichkeiten, die ihre hohe Geburt mit sich bringt, geklagt und gewünscht, in die Mitte der Extreme zwischen Hohe und Niedrige gestellt zu sein. Auch der Weise bezeugt, daß jener Stand der des wahren Glückes ist, indem er betet: "Armuth und Reichthum gib mir nicht".

"Habe nur darauf Acht", fuhr mein Vater fort, "so wirst du finden, daß das Elend der Menschheit zumeist an die höheren und niederen Schichten der Gesellschaft vertheilt ist. Die, welche in der mittleren leben, werden am seltensten vom Mißgeschick getroffen, sie sind minder den Wechselfällen des Glücks ausgesetzt, sie leiden bei weitem weniger an Mißvergnügen und Unbehagen des Leibes und der Seele wie jene, die durch ausschweifend üppiges Leben auf der einen, durch harte Arbeit, Mangel am Notwendigen oder schlechten und unzulänglichen Lebensunterhalt auf der anderen Seite, in Folge ihrer natürlichen Lebensstellung geplagt sind. Der Mittelstand ist dazu angethan, alle Arten von Tugenden und Freuden gedeihen zu lassen. Friede und Genügsamkeit sind im Gefolge eines mäßigen Vermögens. Gemüthsruhe, Geselligkeit, Gesundheit, Mäßigkeit, alle wirklich angenehmen Vergnügungen und wünschenswerten Er-

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Word oder LaTeX?

Word oder LaTeX?

WYSIWYG vs. WYGIWYM
What You See Is What You Get ("Word")

- Word processor system
- Anti-Gutenberg: No distinction between author and typesetter
- Anti-Saussure: Form is chosen by clicking on stylesheets. Afterwards, there is no distinction between form and meaning.
- The input file is also the output file.
- The way the final document looks depends on the program and can vary from user to user.

What You Get Is What You Mean (LaTeX)

- Document preparation system
- Pro-Gutenberg: Clear distinction between author and typesetter.
- Pro-Saussure: The form is chosen by using formatting commands, which are interperted (as in HTML). Still form and meaning are separated.
- The input file containing content and formatting commands (.tex) is not the final output file (.pdf).
- Being a PDF, the way the final document looks is independent from the user.

Logics of LaTeX: Typesetting like Gutenberg
3 steps to the final product

1. *The author writes a text:* Write a text in some editor and save the file with the ending ".tex".
2. *The typesetter takes care of the formatting:* Add the formatting commands where neededin the tex file (bold face, font size etc.).
3. *The printer processes the result of the typesetter:* The tex-file can be compiled into a PDF file. All the formatting is visible now.

`http://www.spiegel.de/netzwelt/tech/textsatz-keine-angst-vor-latex-a-549509.html`

1. The author writes a text

```
A typical day in the life of a first year PhD student: 07:00 Jump out of bed, go to
    bathroom, check out all the linguistics blogs. 08:00 Start reading a new LI-paper
    over breakfast. 09:00 Arrive at the office. Damn! I'm the last one to arrive,
    again! Tomorrow, I will get up earlier. 12:00 Head over to the Mensa with the
    others. The food really sucks, but don't want to miss out on the gossip. 13:50
    Head over to seminar room. First course as an PhD: LaTeX Crash Course. I'm sure it
    'll be awesome. 14:15 Course has started. This teacher doesn't know what she's
    talking about. Students start to leave the room. 15:45 Finally over. She was
    dragging it quite a bit. 16:00 Back at my office. All the second and third year
    PhDs are taking a nap. At least, it's quiet now and I can start working on my
    handout for the retreat. 18:15 Invited talk in the seminar room. Every seat is
    taken. One guy is already standing at the door. 19:15 Question period starts. Why
    is everybody asking questions? I don't know jack. 19:45 Reception after talk.
    Professor and seniors are chatting. Nobody is talking to the speaker. 20:30 Back
    to the office. Long day, but haven't really done anything. I have to work. I have
    to work. I have to work. 21:30 First one to leave the department. 21:00 Stupid
    tram only leaves every 15 minutes. 21:45 Arrive at the gym. Have to stay in shape
    for the coming years. 23:00 Arrive at my room in the dorm. Finally, I have some
    time to do my assignments. 00:00 Hear knocking at my door. Get an invite to watch
    the new show on Netflix. Can't say no, can I?
```

2. The typesetter takes care of the layout

```
\documentclass[12pt]{article}
\usepackage[margin=2.5cm]{geometry}
\usepackage[utf8]{inputenc}

\begin{document}
\thispagestyle{empty}
\noindent {\Large \textbf{A typical day in the life of a first year PhD student}:}

\

\noindent\textit{07:00} Jump out of bed, go to bathroom, check out all the linguistics
    blogs.\\ \textit{08:00} Start reading a new LI-paper over breakfast.\\
\textit{09:00} Arrive at the office. Damn! I'm the last one to arrive, again! Tomorrow
    , I will get up earlier.\\
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    At least, it's quiet now and I can start working on my handout for the retreat.\\
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    already standing at the door.\\
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    jack.\\
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    talking to the speaker.\\
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    to work. I have to work. I have to work.\\
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\textit{23:00} Arrive at my room in the dorm. Finally, I have some time to do my
    assignments.\\
\textit{00:00} Hear knocking at my door. Get an invite to watch the new show on
    Netflix. Can't say no, can I?
\end{document}
```

3. The printer processes the result of the typesetter

A typical day in the life of a first year PhD student:

07:00 Jump out of bed, go to bathroom, check out all the linguistics blogs.
08:00 Start reading a new LI-paper over breakfast.
09:00 Arrive at the office. Damn! I'm the last one to arrive, again! Tomorrow, I will get up earlier.
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1.2 The first steps

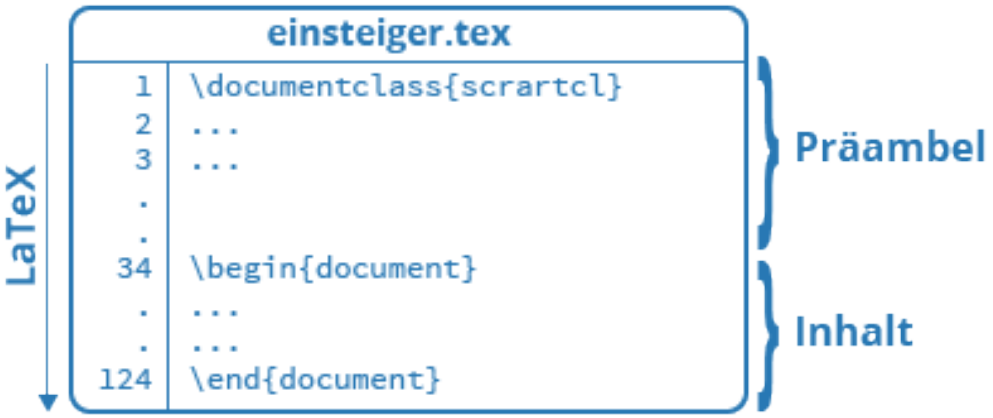
LaTeX Installation

1. Install the following programs in case you haven't installed them yet:
   - Ghostscript
   - Ghostview
   - PDF-Viewer
2. Install the TeX-distribution for your operating system:
   - Windows: MikTeX
   - Mac: MacTeX, TeXLive
   - Linux: TeXLive
3. Install an editor program suitable for LaTeX, e.g. TeXMaker, LEd (only for Windows), TeXWorks (already part of MikTeX and TeXLive).

for more information, see: `https://www.latex-tutorial.com/installation/` `https://en.wikibooks.org/wiki/LaTeX/Installation#TeXmaker`

The first is the worst

The structure of every tex-file is same: There is a preamble and the content.



Preamble: Here, you determine the settings for the entire document and you can load additional commands.[1em]

Content: Here, you write the text and use the commands.

http://latex.tugraz.at/latex/tutorial

Hello LATEX: The first document

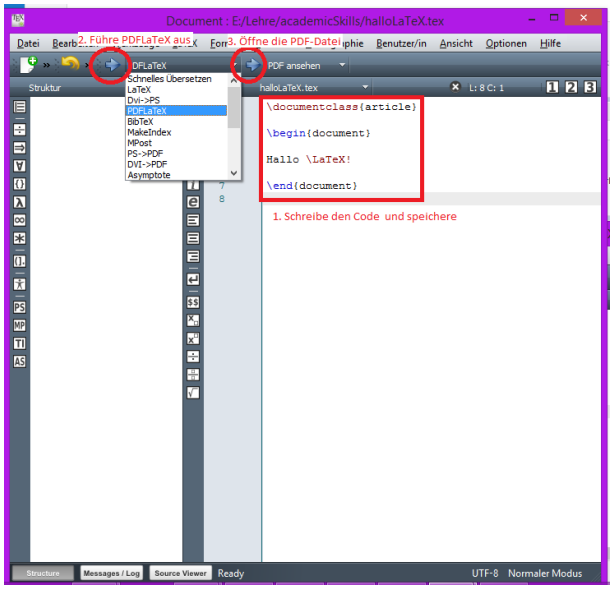
1. Write the following Code in a random Tex editor and save the file as "helloLaTeX.tex".

```
\documentclass{article}

\begin{document}

Hello \LaTeX!

\end{document}
```

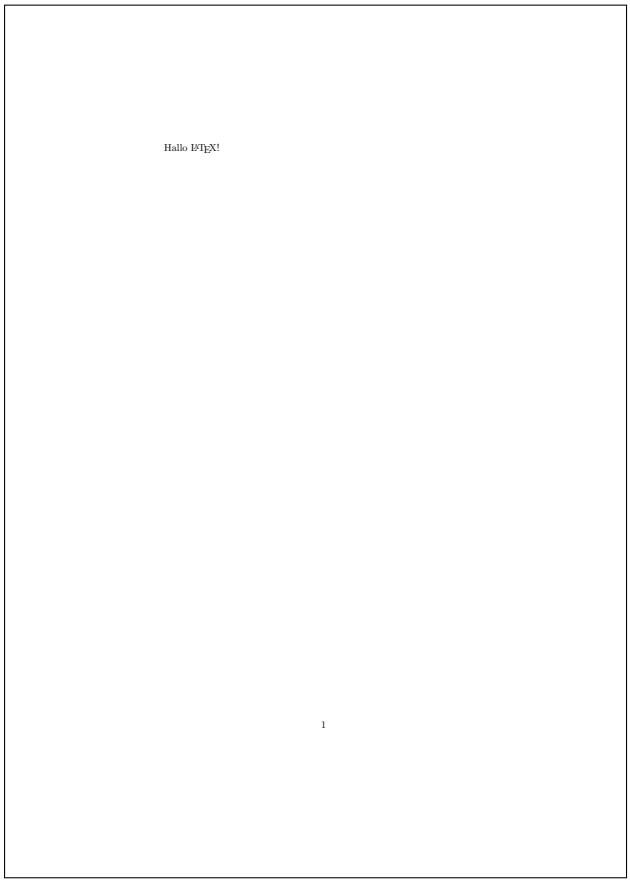
2. Choose the command "pdfLaTeX" in your editor.

3. Open the PDF.

Hello LATEX: TeXMaker



Hello LaTeX



Commands and Environments

Commands

```
\nameofcommand[opt. parameter]{obl. parameter}
```

Environments

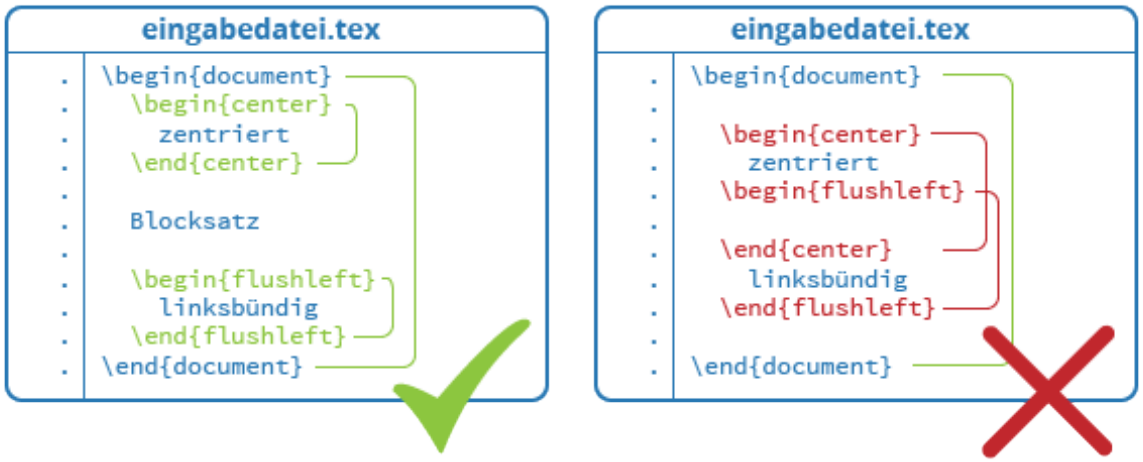
```
\begin{nameofenvironment}[opt. parameter]{obl. parameter}

\end{nameofenvironment}
```

Commands and environments are information in the tex file that alter the look of the PDF-file:

- changes in layout
- output of content
- saving information
- extend functions

No crossing path

Environments can be nested. The respective `begin-end`-path should never cross.



Additional packages
The document classes themselves already contain lots of commands and environments. But quite often you still need additional commands. You can do this by loading packages in the preamble. Packages can also be used to change the font or the language settings.

```
\documentclass{article}
\usepackage[ngerman]{babel} %language settings, not needed for English
\usepackage{mathptmx} %Font Times New Roman
\usepackage[utf8]{inputenc}
%Encoding, allows Unicode-characters (e.g. Umlaute)

\begin{document}

Hallo \LaTeX! Dankeschön für den tollen Textsatz!

Hello \LaTeX! Thanks for the great typesetting!

\end{document}
```

1.3 Elements to structure text

Paragraphs, line and page breaks
paragraphs: LaTeX doesn't care whether or not you make line breaks in the editor or how many spaces you have between words. A new paragraph is induced with the command \par. Alternatively, you can leave a blank line between two paragraphs.

line break: Simply breaking a line in the editor does not lead to a line break in the document. To actually make a line break, you need to put \\ after the line. (This does not work in presentations where you use the documentclass `beamer`.) If you do not use any break-commands, LaTeX breaks the lines automatically.

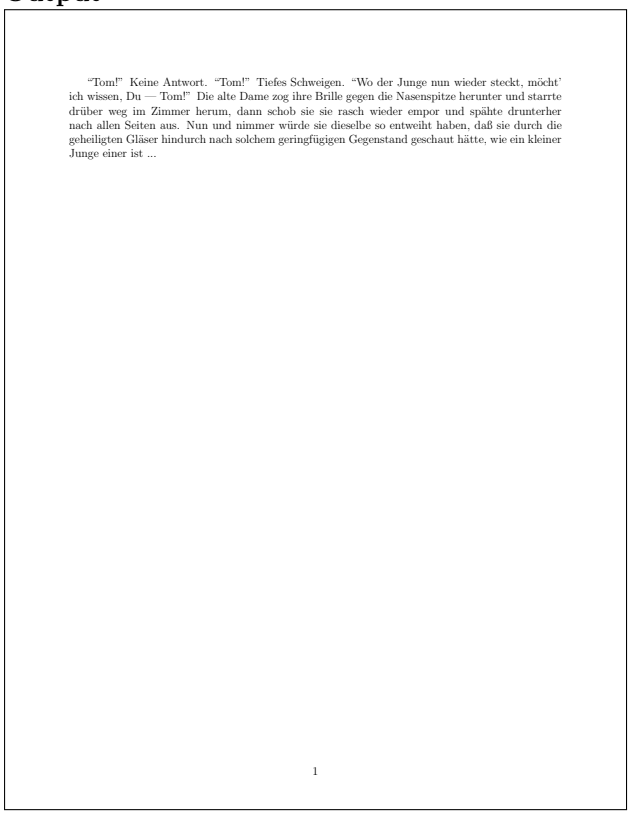
Difference paragraph, line break: A paragraph is a structural unit. If you use a line break, the paragraph is continued. The layout also distinguishes between paragraphs and simple line breaks: With paragaphs, the first line is usually indented; with line breaks, it's not.

Paragraphs and line breaks: Example WYSINWYG
Code

```
...
  ``Tom!''
  Keine Antwort.
  ``Tom!''
```

```
Tiefes Schweigen.
‘‘Wo der Junge nun wieder steckt, möcht’ ich wissen, Du -- Tom!’’
Die alte Dame zog ihre Brille gegen die Nasenspitze herunter und starrte drüber weg
    im Zimmer herum, dann schob sie sie rasch wieder empor und spähte drunterher nach
     allen Seiten aus. Nun und nimmer würde sie dieselbe so entweiht haben, daß sie
    durch die geheiligten Gläser hindurch nach solchem geringfügigen Gegenstand
    geschaut hätte, wie ein kleiner Junge einer ist ...
```

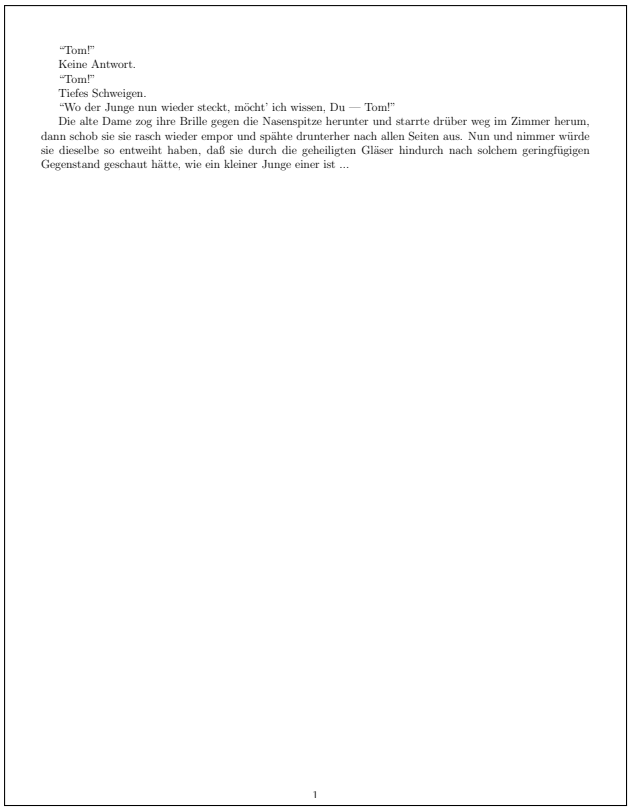
Output



Paragraphs and line breaks: Example WYGIWYM
Code

```
...
‘‘Tom!’’

Keine Antwort.

‘‘Tom!’’

Tiefes Schweigen.

‘‘Wo der Junge nun wieder steckt, möcht’ ich wissen, Du -- Tom!’’

Die alte Dame zog ihre Brille gegen die Nasenspitze herunter und starrte drüber weg im
     Zimmer herum, dann schob sie sie rasch wieder empor und spähte drunterher nach
    allen Seiten aus. Nun und nimmer würde sie dieselbe so entweiht haben, daß sie
    durch die geheiligten Gläser hindurch nach solchem geringfügigen Gegenstand
    geschaut hätte, wie ein kleiner Junge einer ist ...
```

Paragraphs and line breaks: Example WYGIWYM
Output



Page breaks

There are several commands for line breaks, which – in most cases – do the same. With certain settings (`\flushbottom`) however, there are differences:

- `\pagebreak`: To keep the canons of page construction balanced, there might be more white space between paragraphs. Floating Objekts (figures, tables, etc.) that do not fit on the page, are automatically put on the next page.
- `\newpage`: The canons of page construction is unimportant. There is no additional white space between paragraphs. Floating Objekts (figures, tables, etc.) that do not fit on the page, are automatically put on the next page.
- `\clearpage`: To keep the canons of page construction balanced, there might be more white space between paragraphs. Floating Objekts (figures, tables, etc.) that do not fit on the page, are automatically put on a separate page.

Titles

Elements are marked as titles by placing a command before the text. This command creates a certain formatting (e.g. automatic numbering), makes an entry in the table of contents and paves the way to have a reference to the section. A document can be structured using the following title commands.:

- `\part{title}`: Part
- `\chapter{title}`: Chapter (only for the document classes `book`, `report`, `scrbook` or `scrreprt`)
- `\section{title}`: Section
- `\subsection{title}`: Subsection
- `\subsubsection{title}`: Subsubsection
- `\paragraph{title}`: Paragraph (not to be confused with `\par`
- `\subparagraph{title}`: Subparagraph
- `\appendix`: Appendix. This command separates the main text from the appendix. Afterwards, chapters, sections, etc. have a different numbering.

1.4 Front Matter and Table of Contents

Front Matter and Table of Contents

Usually, every document has a title and many (especially books) have a table of contents. There are two options for the front matter and the table of contents:

1. You can make both manually.

2. You can use the predefined commands.

Front Matter and Table of Contents: Code

```
...
\title{My first title %This is the minimum requirement,
                      %to create a title
      \thanks{I would like to thank myself.} %Creates a footnote for the
          acknowledgements.
      } \author{I} %Additional information. If missing, many LaTeX editors produce a
          warning.
\date{\today} %Additional information. You can enter a concrete date
              %or use the command \today, which automatically produces
              %the current date.
%\institute{Institut für Linguistik} %Additional information.
\begin{document}
\maketitle %Creates the front matter with the given information.
\tableofcontents %Creates the table of contents. The page number of every
                 %section appears automatically
...
\end{document}
```

Front Matter and Table of Contents: Example

My first title *

I

April 21, 2018

...

Contents

*I would like to thank myself.

1

Front Matter and Table of Contents: Hacks

- Depending on the document class, you can incllude further information:

```
\subtitle{Subtitle} %scrbook, scrartcl, ...
\institute{Name institute} %beamer
\logo{\includegraphics[options]{file}} %beamer
\publishers{Name publisher} %scrbook, scrartcl, ...
\subject{Typecast} %scrbook, scrartcl, ...
\dedication{Dedication} %scrbook, scrartcl, ...
...
```

- In case certain sections should not appear in the table of contents, you can mark them with the suffix -*: `\section*{Unofficial section}`

- In most document classes, the title automatically appears on a separate page (except for articles), if you want to enforce a separate title page you can use the `titlepage` environment:

```
\begin{titlepage}
...
\end{titlepage}
```

Front Matter and Table of Contents: Hacks

- Layout and font size are chosen automatically for each section level. You can also manually change this, but this requires a bit more knowledge about LaTeX.

- Depending on the document class, the table of contents contains only a certain number of section levels (e.g. `paragraph` is usually missing). The number of levels can be manually adapted: `\setcounter{tocdepth}{5}`
- Sections are usually only numbered until the level`subsubsection`. You can change that as well: `\setcounter{secnumdepth}{5}`

1.5 Blank Lines and Line Spacing

Blank Lines
A blank line in the editor does not produce a blank line in the document. To get a true blank line, there are several tricks:

- \\+blank line: This is a line break plus a new paragraph. In most contexts (but not in all), this produces a blank line.
- `\\[\baselineskip]`: After the line break you can optionally specify a measure for the line space. `\baselineskip` is the height of one line.
- You create an empty paragraph:

```
a paragraph

\

another paragraph
```

Line spacing
Sometimes, you need a line spacing different from the standard one. The line spacing can be controlled by a command:

```
\setlength{\baselineskip}{10pt} %absolute line spacing
\renewcommand{\baselinestretch}{1.5} %relative line spacing
```

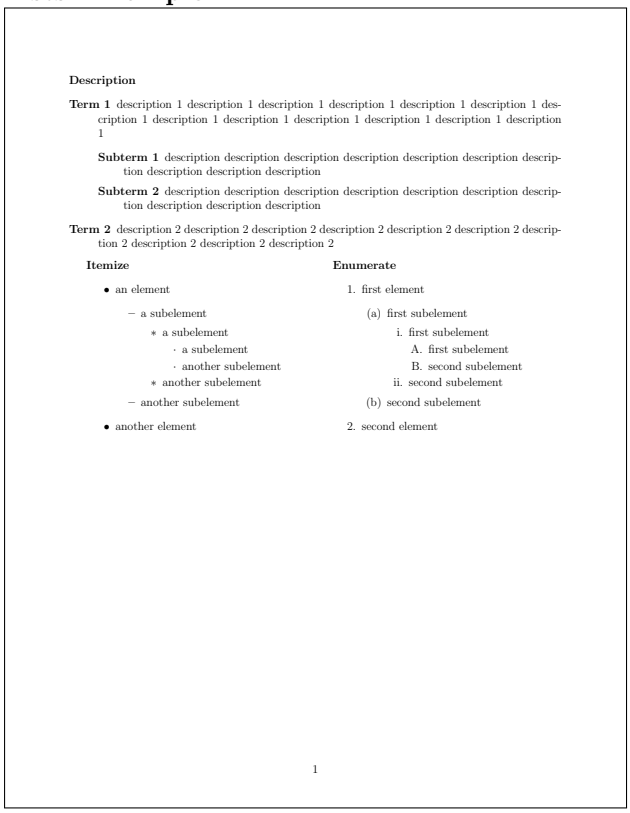
1.6 Lists

Lists
There are three important list environments:

- `itemize`: unnumerated lists
- `enumerate`: numerated lists
- `description`: unnumerated lists of descriptions

```
\begin{description}
\item[Word 1] Description 1
\item[Word 2] Description 2
\end{description}

\begin{itemize}
\item an element
\item another element
\end{itemize}

\begin{enumerate}
\item first element
\item second element
\end{enumerate}
```

Lists: Example



Description

Term 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1 description 1

Subterm 1 description description description description description description description description description description description description

Subterm 2 description description description description description description description description description description description description

Term 2 description 2 description 2 description 2 description 2 description 2 description 2 description 2 description 2 description 2 description 2 description 2

Itemize

- an element
  - a subelement
    - a subelement
      - a subelement
      - another subelement
    - another subelement
  - another subelement
- another element

Enumerate

1. first element
   (a) first subelement
      i. first subelement
         A. first subelement
         B. second subelement
      ii. second subelement
   (b) second subelement
2. second element

1

Lists: Hacks

- The environments can be nested. With `enumerate` und `itemize`, the list kind of numeration changes depending on the level. With both these environments, you can nest at most 4 times.
- The spacing between elements can be adapted with `\setlength{\itemsep}{spacing}`. The command is to be included right after `\begin{description|itemize|enumerate}`.
- The `itemize` symbol can be changed::

```
\renewcommand{\labelitemi}{Symbol Ebene 1}
\renewcommand{\labelitemii}{Symbol Ebene 2}
\renewcommand{\labelitemiii}{Symbol Ebene 3}
\renewcommand{\labelitemiv}{Symbol Ebene 4}
```

- The `enumerate` numbering can be changed with the package `enumitem`:

```
\usepackage{enumitem} %Flexible enumerates/itemizes
...
\begin{document}
...
\begin{enumerate}[label=\alph*)]
%[label=\alph*|\Alph*|\arabic*|\roman*|\Roman*]
\item Test 1
\item Test 2
\item Test 3
\end{enumerate}
 ...
```

1.7 Font Formatting

Font Formatting

Certain changes are simple:

- **bold face:** `\textbf{bold text}`
- *italic:* `\textit{italic text}`
- ***bold face italic:*** `\textbf{\emph{bold italic text}}`
- *Slanted:* `\textsl{slanted text}`
- *Emphasized (*most often *italic):* `\emph{emphasized text}`
- underlined: `\underline{underlined text}`
- SMALL CAPS: `\textsc{text in small caps}`

The package `ulem` allows various types of underlining:

- underlined: `\uline{underlined text}`
- doubly underlined: `\uuline{doubly underlined text}`
- wavy underlined: `\uwave{wavy underlined text}`
- ~~Struck OUT~~: `\sout{crossed out text}`
- *crossed OUT*: `\xout{crossed out text}`

You can include the package in the preamble with `\usepackage[normalem]{ulem}`. With the option `[normalem]`, all `emph` parts stay italic. Otherwise `emph` parts are underlined.

Font formatting: Switches, environments, commands
Font formatting can be produced differently.

1. **Commands:** A command marks exactly the text that is in between the curly brackets. *Downside:* You cannot start a new paragraph within a command.
2. **Environments:** An environment marks the text inside the environment. *Downside:* You cannot have an environment within a paragraph.

```
\begin{bfseries}
...
\end{bfseries}
```

```
\begin{itshape}
...
\end{itshape}
```

```
\begin{em}
...
\end{em}
```

3. **Switches:** Switches are the commands `\itshape`, `\bfseries`, `\slshape`, `\scshape`, which are simply written somewhere in the text and don't take an argument. The following text appears in the respective font formatting (probably until the end of the environment, unless other font formatting commands/environments/switches are used. The scope of a switch can be rstricted by `{ }` .

Font size

- The font size of a document is determined in the document class. The standard for font sizes is 10pt. It can be changed to 11pt or 12pt: `\documentclass[12pt]{article}` `\documentclass[11pt]{book}`
- The class `memoir` allows further options: 9pt, 10pt, 11pt, 12pt, 14pt, 17pt, 20pt, 25pt, 30pt, 36pt, 48pt und 60pt. To use them, the option `extrafontsizes` must be included. `\documentclass[30pt,extrafontsizes]{memoir}`
- Additionally, you can change the font size in the document. There are several commands for this. They change the font size relatively to the size in the document class. The commands are working like the switches for font formatting.

Font size: Commands

Command	standard font size											
	9pt	**10pt**	**11pt**	**12pt**	**14pt**	**17pt**	**20pt**	**25pt**	**30pt**	**36pt**	**48pt**	**60pt**
\miniscule	**4pt**	**5pt**	**6pt**	**7pt**	**8pt**	**9pt**	**10pt**	**11pt**	**12pt**	**14pt**	**17pt**	**20pt**
\tiny	5pt	6pt	7pt	8pt	9pt	10pt	11pt	12pt	14pt	17pt	20pt	25pt
\scriptsize	6pt	7pt	8pt	9pt	10pt	11pt	12pt	14pt	17pt	20pt	25pt	30pt
\footnotesize	7pt	8pt	9pt	10pt	11pt	12pt	14pt	17pt	20pt	25pt	30pt	36pt
\small	8pt	9pt	10pt	11pt	12pt	14pt	17pt	20pt	25pt	30pt	36pt	48pt
\normalsize	**9pt**	**10pt**	**11pt**	**12pt**	**14pt**	**17pt**	**20pt**	**25pt**	**30pt**	**36pt**	**48pt**	**60pt**
\large	10pt	11pt	12pt	14pt	17pt	20pt	25pt	30pt	36pt	48pt	60pt	72pt
\Large	11pt	12pt	14pt	17pt	20pt	25pt	30pt	36pt	48pt	60pt	72pt	84pt
\LARGE	12pt	14pt	17pt	20pt	25pt	30pt	36pt	48pt	60pt	72pt	84pt	96pt
\huge	14pt	17pt	20pt	25pt	30pt	36pt	48pt	60pt	72pt	84pt	96pt	108pt
\Huge	17pt	20pt	25pt	30pt	36pt	48pt	60pt	72pt	84pt	96pt	108pt	120pt
\HUGE	**20pt**	**25pt**	**30pt**	**36pt**	**48pt**	**60pt**	**72pt**	**84pt**	**96pt**	**108pt**	**120pt**	**132pt**

- \command: only for the class `memoir`
- : sizes that are defined in most classes

Font

Some changes in font can be achieved by using commands or sswitchs. These changes are rather used to emphasize something:

- san serif: `\textsf{san serif}`
- serif: `\textrm{serif}`
- `type writer`: `\texttt{type writer}`

There are many possibilities to change the font for the entire document. The best option, however, is to include a package:

```
...
\usepackage{font}
...
\begin{document}
...
\end{document}
```

Font: packages

Command	Font	effect
\usepackage{mathptmx}	Times New Roman	normal text & formulae
\usepackage{times}	Times New Roman	normal text
\usepackage{mathpazo}	Palatino	normal text & formulae
\usepackage{courier}	Courier	type writer look
\usepackage[scaled]{helvet}	Helvetica	san serif
\usepackage{bookman}	Bookman	normal text
\usepackage{fouriernc}	New Century Schoolbook	normal text & formulae
\usepackage{newcent}	New Century Schoolbook	normal text
\usepackage{avant}	Avant Garde	san serif
\usepackage{charter}	Charter	normal text
\usepackage{chancery}	Zapf Chancery	normal text
(Voreinstellung)	Computer Modern	normal text & formulae

For more fonts, see http://www.tug.dk/FontCatalogue/.

1.8 Alignment

Alignment of paragraphs

- centered: \begin{center} ... \end{center}
- flush left: \begin{flushleft} ... \end{flushleft}
- flush right: \begin{flushright} ... \end{flushright}
- justified: standard alignment

These environments additionally create a vertical spacing between paragraphs. If needed, this can be avoided by using switches:

- centered: \centering
- flush left: \flushleft
- flush right: \flushright
- justified: standard alignment

Tip: To get back to a justified alignment after using a switch, the respective paragraph can be put in curly brackets { }.

Indentation of paragraphs
By default (different from Word), the first line of every paragraph is indented. You can change that with:

- \noindent: in front of the paragraph; prevents indentation of this paragraph
- \setlength{\parindent}{0pt}: at the point in the document; all following paragraphs have no indentation. *Tip:* You can choose a different measure, and increase or decrease indentation.

fills and spaces
hfill/vfill:

- \hfill: switch; the following text is aligned with the right margin of the page (if there is not enough space, there will be a line break)
- \vfill: switch; the following text is aligned with the bottom margin of the current page (if there is not enough space, there will be a page break)

hspace vs. vspace:

- \hspace{width}: Creates a horizontal white space with the chosen width; has no effect at the beginning and at the end of the line

- `\hspace*{width}`: Creates a horizontal white space with the chosen width; even at the beginning and at the end of the line
- `\vspace{height}`: Creates a vertical white space with the chosen height; has no effect at the beginning and at the end of a page
- `\vspace*{height}`: Creates a vertical white space with the chosen height; even at the beginning and at the end of a page

Superscripts and Subscripts
Superscripts and Subscripts are mainly used in mathematical formulae. That is why there is a special command in the so-called *mathmode* (`$ ... $`):

- Text$_{subscript}$: `Text$_{subscript}$` (The curly brackets mark the scope of the subscript command.)
- Text^{superscript}: `Text$^{superscript}$` (The curly brackets mark the scope of the superscript command.)

The *mathmode* also changes the font formatting. Also, spaces are not shown (you need `~` or `\ ` (backslash+space) between words). Alternatively, there are normal commands:

- Text$_{\text{subscript}}$: `Text\textsubscript{subscript}` (Needs the package `fixltx2e`: `\usepackage{fixltx2e}`)
- Text$^{\text{superscript}}$: `Text\textsuperscript{superscript}`

Or you define subscript and superscript commands yourself:

- raise$^{\text{box}}$: `\raisebox{measure}{Text}, e.g. raise{\raisebox{0.1em}{b}\raisebox{0.2em}{o}\raisebox{0.3em}{x}}`
- raise$_{\text{box}}$: `\raisebox{measure}{Text}, e.g. raise{\raisebox{-0.1em}{b}\raisebox{-0.2em}{o}\raisebox{-0.3em}{x}}`
- the measure determines the position: positive numbers lead to superscripts, negative ones to subscripts
- *Attention!:* `\raisebox` doesn't change the font size. This has to be done manually: `\raisebox{measure}{\footnotesize text}`

Multicolumn text
The entire document can appear in two columns if the option `twocolumn` is used in the documentclass: `\documentclass[twocolumn]{article}`

The use of columns is more flexible with the package `multicol`. With this package, certain paragraphs can be put in two or more columns:

Text in three columns

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Multicolumn text

```
\documentclass{article}
...
\usepackage{multicol}
...
```

```
\begin{document}
...

%number columns, title (optional), distance between columns (optional)
\begin{multicols}{3}[Text in three columns][1em]
\scriptsize
\blindtext
\end{multicols}
...

\end{document}
```

Within the `multicols` environment, a column break can be manually produced by `\columnbreak`.

The width of the separator line between the columns can be changed as well (the standard is 0pt):
`\setlength{\columnseprule}{width}`

Minipage

A minipage is a structural element that defines a page within the current page (even within lines). With this environment, formatting is extremely flexible.

```
%Position: t (top), b (bottom), c (center)
\begin{minipage}[position]{width}
...
\end{minipage}
```

The minipage is also an easy way to place elements next to each other, e.g. tables, but also numbering environments for linguistic examples.

A	B	C
1	2	3
4	5	6

D	E	F
1	2	3
4	5	6

```
\begin{minipage}[t]{.2\textwidth}
\begin{tabular}{|l|l|l|}
...
\end{tabular}
\end{minipage}
\hfill
\begin{minipage}[t]{.7\textwidth}
\begin{tabular}{|l|l|l|}
...
\end{tabular}
\end{minipage}
```

Minipage Tipps

- Footnotes within a minipage refer to only this page and are also shown within the minipage. A global footnote must be made with `\footnotemark[<Zahl>]` und `\footnotetext[<Zahl>]{<Text>}`.
- Floating objects have a different numbering.

Tabs

In "Word" programs, tabs are very popular to align text. In LaTeX, this is possible by using the`tabbing` environment.

The first line defines the tabs
The 2nd line uses the tabs

```
\begin{tabbing}
The \= first \= line \= defines \= the \= tabs\\
The \> 2nd \> line \> uses \> the \> tabs
\end{tabbing}
```

- \kill: after the first line; the first line is not shown in the document
- \+: shifts the beginning of the line to the first tab
- \-: resets the beginning of the line
- \pushtabs: saves old tabs, enables setting new tabs
- \poptabs: recreates the old tabs

1.9 Page Format

Page format
By default, LaTeX leaves a very wide page margin, leaving rather little room for text. The page format can be easily modified with the package `geometry`, which is included ideally right after the document class:

```
%page margin everywhere 2cm
\usepackage[a4paper,margin=2cm]{geometry}

%different margins
\usepackage[a5paper,left=2cm,right=3cm,top=3cm,bottom=2cm]{geometry}

%landscape
\usepackage[landscape]{geometry}
```

Headers and Footers
By default, LaTeX has only a footer with an arabic page number in the center. Otherwise, headers and footers are empty. Any modifications require additional commands:

- \pagestyle{Style}: changes the page style on all the following pages
- \thispagestyle{Style}: changes the page style on the current pages

Styles:

	header	footer
`plain`	empty	page number, centered
`empty`	empty	empty
`heading`	page number, title information as set in the document class	empty
`myheadings`	Content of \leftmark{Information}, \rightmark{Information}	empty

Fancy headers and footers
The package `fancyhdr` allows for tripartite headers and footers, and separation lines:

```
...
\usepackage{fancyhdr} %including fancyhdr
\pagestyle{fancy} %activates the package
\lhead{left head}
\chead{center head}
\rhead{right head}
\lfoot{}
\cfoot{\thepage}
```

```
\rfoot{}
\renewcommand{\headrulewidth}{0.4pt}
\renewcommand{\footrulewidth}{0.4pt}
...
```

Page numbering
By default, the page number appears as an arabic number and starts with "1". But, especially with longer documents that have a preface, you might want to change the numbering.

Changing the page numbering:
`\pagenumbering{style}`
Stile:

- `arabic`: arabic number (1, 2, 3, 4, ...)
- `roman`: small roman number (i, ii, iii, iv, ...)
- `Roman`: big roman number (I, II, III, IV, ...)
- `alph`: small letter (a, b, c, d, ...)
- `Alph`: big letter (A, B, C, D, ...)

Setting the page counter:
`\setcounter{page}{number}`
Using the page counter (e.g. for headers and footers):
`\thepage`

Footnotes
Footnotes are produced by the command `\footnote` at the respective point in the text:
`This is is text.\footnote{This is the footnote.}`
In certain environments, the command `\footnote` cannot be used (e.g. in linguistic examples). In these cases, the command can be divided into two commands:

```
\begin{environment}
This is the text.\footnotemark %sets a footnotenumber in the text
\end{environment}

%Produces the footnote in the footer
\footnotetext{This is the footnote.}
```

Finally, the footnote number can be modified manually (e.g. if you want to refer to another footnote).

```
\footnote[number]{text}
\footnotemark[number]
\footnotetext[number]{text}
```

Often at the beginning of the document, there is a thank-you footnote, which is marked with an asterisk. This footnote is produced by the command `\thanks` (see slide 15)

1.10 Lengths and Counters

Lengths and Counters
In LaTeX, there are many predefined lengths. These definitions can be overriden with `\setlength`:
`\setlength{\lengthcommand}{length}` or short
`\lengthcommandLength`

All automatic numerations have counters that run internally and increase by 1 with every instance. This automatic numeration can be modified manually by:

- `\addtocounter{counter}{number}`: Increases the chosen counter with the chosen number (or decreases it with a negative value)
- `\setcounter{counter}{number}`: Sets the counter to the number

Units
We have seen a lot of commands that need a concrete size, height, or width. LaTeX knows different units:

- `pt`: Point $\approx \frac{1}{72}$in $\approx \frac{1}{3}$mm
- `cm`/`mm`: centimeter/millimeter
- `in`: Inch = 2,54cm
- `ex`: size that `x` requires in the current font
- `em`: size that `M` requires in the current font
- `\textwidth`: width that the text requires (usually used with a factor, e.g. `0.5\textwidth`
- `\columnwidth`: width that the text requires (usually used with a factor, e.g.`0.5\columnwidth`

1.11 Labels and Links

Labels and links
Using the commands `\label` and `\ref`, you can refer to certain elements in the text.

- `\label`: sets a label
- elements that can carry a label: `section`, `subsection`, etc.; `footnote`, `table` environments, `figure` environments, `ex` environments (linguistic examples), `itemize` environments, `enumerate` environments

```
...
\section{data}\label{sec:data}

In this section, it is shown ...
```

- `\ref{name label}`: produces the number of the respective element
- `\pageref{name label}`: produces the page number of the respective element

A label always belongs to the next higher structural element. Thus, it is best if the label should follow the structural element directly. In `table` and `figure` environments, `\label` follows `\caption`. The label should always be unambiguous.

Attention!: The command `\ref` and `\pageref` just produce numbers. The type of the element should be written in front of the command. `As shown in section \ref{sec:Daten}, ... On page \pageref {sec:Daten}, I have shown, ...`

Hyperref
The package `hyperref` allows hyperlinks in the PDF document.
`\usepackage[<Option1>, <Option2>,...]{hyperref}`.
Also, in some PDF viewers (e.g. Adobe), a table of contents appears.

Important options:

- `hidelinks`: Hyperlinks appear without a box and in black
- `pdftitle=<title>`: Determines the PDF title
- `pdfauthor=<author>`: Determines the author

- `breaklinks=true`: Allows a line break in the link
- `dvips`: Option if you do not use pdfLaTeX

`hyperref` also provides two commands to link to websites:

```
\url{<URL>} %needs the complete url
\href{<URL>}{<text>} %The text is shown and links to the url
```

If you want to refer to a certain position in the text that is not a structural elements, you can use the commands \hypertarget and hyperlink:

```
Here's a \hyperlink{target}{hyperlink}.

\newpage
It refers to this \hypertarget{target}{Wort}.
```

1.12 Special Characters

Special Characters
Special Characters in LaTeX are displayed nice and stable. The character is inserted with a command:

character	code	character	code	character	code
( )	( )	[ ]	[ ]	{ }	\{ \}
.	.	!	!	?	?
:	:	,	,	;	;
-	-	–	--	—	---
“text”	‘‘text’’	”‘text”’	"‘text"’	’	’
&	\&	/	/	\	\textbackslash
#	\#	%	\%	_	_
nbsp	~	@	@	~	\textasciitilde
€	\texteuro (needs textcomp)	$	\$	£	\pounds

Extensions to the alphabet
Extensions to the alphabet:
(not necessary, if the encoding is set to Unicode)

character	code	character	code	character	code
ß	\ss	ø, Ø	\o, \O	å, Å	\aa, \AA
ł, Ł	\l, \L	æ, Æ	\ae, \AE	œ, Œ	\oe, \OE

Diacritics:

name	output	code
accute accent	á	\’{a}
grave accent	à	\‘{a}
circumflex accent	â	\^{a}
wedge	ǎ	\v{a}
tilde	ã	\~{a}
trema	ä	\"{a}
ring	å	\r{a}
macron	ā	\={a}
underscore	a̲	\b{a}
breve	ă	\u{a}
double acute accent	ő	\H{a}
dot	ȧ	\.{a}
cedille	ą	\c{a}

Greek alphabet

character	code	character	code
A	`A`	α	`$\alpha$`
B	`B`	β	`$\beta$`
Γ	`$\Gamma$`	γ	`$\Gamma$`
Δ	`$\Delta$`	δ	`$\delta$`
E	`E`	ϵ, ε	`$\epsilon$, $\varepsilon$`
Z	`Z`	ζ	`$\zeta$`
H	`H`	η	`$\eta$`
Θ	`$\Theta$`	θ, ϑ	`$\theta$, $\vartheta$`
I	`I`	ι	`$\iota$`
K	`K`	κ	`$\kappa$`
Λ	`$\Lambda$`	λ	`$\lambda$`
M	`M`	μ	`$\mu$`
N	`N`	ν	`$\nu$`
Ξ	`$\Xi$`	ξ	`$\xi$`
O	`O`	o	`o`
Π	`$\Pi$`	π, ϖ	`$\pi$, $\varpi$`
P	`P`	ρ, ϱ	`$\rho$, $\varrho$`
Σ	`$\Sigma$`	σ, ς	`$\sigma$, $\varsigma$`
T	`T`	τ	`$\tau$`
Υ	`$\Upsilon$`	υ	`$\upsilon$`
Φ	`$\Phi$`	ϕ, φ	`$\phi$, $\varphi$`
X	`X`	χ	`$\chi$`
Ψ	`$\Psi$`	ψ	`$\psi$`
Ω	`$\Omega$`	ω	`$\omega$`

IPA characters

To display IPA characters, you need to include the package `tipa`. The IPA characters that are not part of the latin alphabet require special commands. The `tipa` package also provides the command `\textipa{}`. In the curly brackets, characters only require a short command.

Notes:

- To avoid conflicts with other packages, `tipa` should be used with the option `[safe]`.
- To use signs for tones, `tipa` must be used with the option `[tone]`.

All IPA characters are summarized in the chart "IPA-Chart".

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ \textrtailt \textrtaild \;t \;d	c ɟ \textbardotlessj \textbardotlessj	k g \textscriptg g	q ɢ \textscg \;G		ʔ \textglotstop ʔ
Nasal	m	ɱ \textltailm M		n		ɳ \textrtailn \;n	ɲ \textltailn \textltailn	ŋ \textipa{N} N	ɴ \textscn \;N		
Trill	ʙ \textscb \;B			r					ʀ \textscr \;R		
Tap or Flap		ⱱ no command available no command available		ɾ \textfishhookr R		ɽ \textrtailr \;r					
Fricative	ɸ β \textphi \textbeta F B	f v	θ ð \texttheta \textipa{D} T D	s z	ʃ ʒ \textesh \textyogh S Z	ʂ ʐ \textrtails \textrtailz \;s \;z	ç ʝ \c{c} \textctj \c{c} J	x ɣ \textgamma G	χ ʁ \textchi \textinvscr X K	ħ ʕ \textcrh \textrevglotstop \textcrh Q	h ɦ \texthth H
Lateral Fricative				ɬ ɮ \textbeltl \textOlyoghlig \textbeltl \textOlyoghlig							
Approximant		ʋ \textscriptv V		ɹ \textturnr \texttturnr		ɻ \textturnrrtail \;R	j	ɰ \texttturnmrleg \texttturnmrleg			
Lateral Approximant				l		ɭ \textrtaill \;l	ʎ \textturny \textturny	ʟ \textscl \;L			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

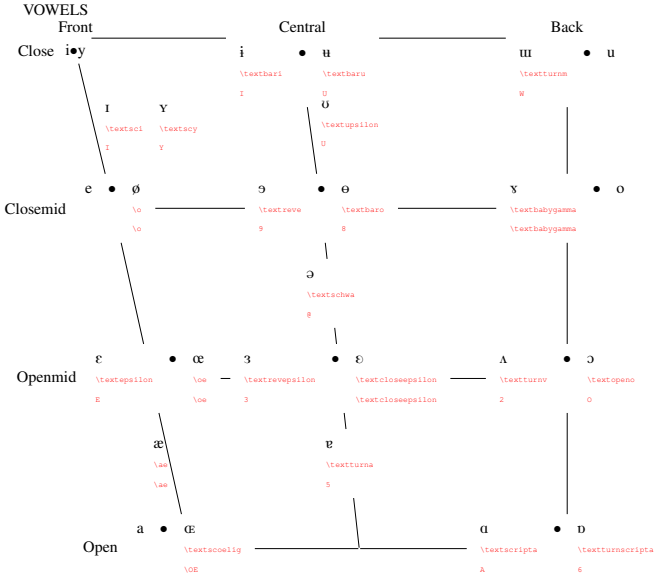
CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ \textbullseye \to	Bilabial	ɓ \texthtb \tb	Bilabial	’	Examples:
| \textpipe |	Dental	ɗ \texthtd \td	Dental	p’	Bilabial
! \textpipe!	(Post)alveolar	ʄ \sout{\textesh} \sout{S}	Palatal	t’	Dental/alveolar
ǂ \textdoublebarpipe \textdoublebarpipe	Palatoalveolar	ɠ \texthtg \;g	Velar	k’	Velar
‖ \textdoublepipe ||	Alveolar lateral	ʛ \texthtscg \;G	Uvular	s’	Alveolar fricative

OTHER SYMBOLS

ʍ \textturnw *w	Voiceless labial-velar fricative	ɕ \textctc C	ʑ \textctz \textctz	Alveolo-palatal fricatives
w	Voiced labial-velar approximant	ɺ \textturnr *r		Voiced alveolar lateral flap
ɥ \textturnh 4	Voiceless labial-palatal approximant	ʃʝ \texththeng \texththeng		Simultaneous ʃ and x
ʜ \textsch \;H	Voiceless epiglottal fricative			
ʢ \textbarrevglotstop \textbarrevglotstop	Voiced epiglottal fricative	Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.		
ʡ \textbarglotstop \textbarglotstop	Epiglottal plosive		k͡p \texttoptiebar{kp} \t(kp)	t͡s \textbottomtiebar{ts} \t*(ts)

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. n̥

◌̥	Voiceless	n̥ d̥ \textsubring{n} \r*n	◌̤	Breathy voiced	b̤ a̤ \textsubumlaut{b} \"*b	◌̪	Dental	t̪ d̪ \textsubbridge{t} \\|t
◌̬	Voiced	s̬ t̬ \textsubwedge{s} \v*n	◌̰	Creaky voiced	b̰ a̰ \textsubtilde{b} \~*b	◌̺	Dental	t̺ d̺ \textinvsubbridge{t} |)t
◌ʰ	Aspirated	tʰ dʰ t^{h} t\super h	◌̼	Linguolabial	t̼ d̼ \textseagull{t} |m{t}	◌̻	Laminal	t̻ d̻ \textsubsquare{t} \textsubsquare{t}
◌ʷ	More rounded	ɔʷ \textsubrhalfring{\textopeno} |)O	◌ʷ	Labialized	tʷ dʷ t^{w} t\super w	◌̃	Nasalized	ẽ \~{e} \~{e}
◌ʲ	Less rounded	ɔʲ \textsublhalfring{\textopeno} |(O	◌ʲ	Palatalized	tʲ dʲ t^{j} t\super j	◌ⁿ	Nasal release	dⁿ d^{n} d\super n
◌̟	Advanced	u̟ \textsubplus{u} |+u	◌ˠ	Velarized	tˠ dˠ t^{\textgamma} t\super G	◌ˡ	Lateral release	dˡ d^{l} d\super l
◌̠	Retracted	e̠ \textsubbar{e} \-*e	◌ˤ	Pharyngealized	tˤ dˤ t^{\textrevglotstop} t\super Q	◌̚	No audible release	d̚ d\textcorner d\textcorner
◌̈	Centralized	ë \"{e} \"{e}	~	Velarized or pharyngealized	ɫ \textsuperimposetilde{l} |~{l}			
◌̽	Mid-centralized	e̽ \textovercross{e} |x{e}	◌˞	Raised	ɹ̝ \textraising{e} |'{e}	(ɹ̝ = voiced alveolar fricative)		
◌̩	Syllabic	n̩ \textsyllabic{n} \s{n}	◌̞	Lowered	β̞ \textlowering{e} |'{e}	(β̞ = voiced bilabial approximant)		
◌̯	Non-syllabic	e̯ \textsubarch{e} \textsubarch{e}	◌̘	Advanced Tongue Root	e̘ \textadvancing{e} |<{e}			
◌˞	Rhoticity	ɔ˞ a˞ \textschwa\textrhoticity \textschwa\textrhoticity	◌̙	Retracted Tongue Root	e̙ \textretracting{e} |>{e}			

SUPRASEGMENTALS

ˈ	Primary stress \textprimstress "	
ˌ	Secondary stress \textsecstress ""	ˌfoʊnəˈtɪʃən \textsecstress fo\textupsilon n\textschwa\textprimstress t\textsci\textesh\textschwa n "" fo\textupsilon n\textschwa\textprimstress t\textsci\textesh\textschwa n
ː	Long	eː e\textlengthmark e:
ˑ	Half-long	eˑ e\texthalflength e;
˘	Extra-short	ĕ \u{e} \u{e}
|	Minor (foot) group \textvertline \textvertline	
‖	Major (intonation) group \textdoublevertline \textdoublevertline	
.	Syllable break	ɹi.ækt \textturnr i.\ae kt \textturnr i.\ae kt
‿	Linking (absence of a break) \textbottomtiebar{} \t*{}	

TONES AND WORD ACCENTS

LEVEL			CONTOUR	
e̋ or \H{e}	˥ \tone{55}	Extra high	ě or \v{e}	˩˥ \tone{15}	Rising
é \'{e}	˦ \tone{44}	High	ê \^{e}	˥˩ \tone{51}	Falling
ē \={e}	˧ \tone{33}	Mid	e᷄ \texthighrise{e}	˧˥ \tone{45}	High rising
è \`{e}	˨ \tone{22}	Low	e᷅ \textlowrise{e}	˨˩ \tone{12}	Low rising
ȅ \textdoublegrave{e}	˩ \tone{11}	Extra low	e᷈ \textrisefall{e}	˩˥˩ \tone{454}	Rising-falling
↓ \textdownstep	Downstep		↗ \textglobrise	Global rise	
↑ \textupstep	Upstep		↘ \textglobfall	Global fall	

Mathmode
Some symbols must be surrounded by `$...$`. These characters put the content in the so-called `mathmode`.
Properties of the mathmode:

- *Thetextinthemathmodeisitalic.*

  Solution: Thetextinthemathmodeisitalic.

  ```
  $\rm{The text in the mathmode is italic.}$
  ```

- *Spacesareignored.*

  Lösung: *Spaces are ignored.*

  ```
  $Spaces\ are\ ignored.$
  ```

- *Line breaks are not possible.Zeilenumbrüche sind nicht möglich.*

  Lösung: *Line breaks are not possible.*

  Zeilenumbrüche sind nicht möglich.

  ```
  $Line\ breaks\ are\ not\ possible.$\\$Zeilenumbr\ddot{u}che\ sind\ nicht\ m\ddot{o
  }glich.$
  ```

- *Diacritics have different commands.*

- *Tables need a different environment.*

  ```
  $\begin{array}{lll} ... \end{array}$
  ```

Conclusion:
The mathmode should only be used to display formulae and certain characters.

Mathmode for linguists
In linguistics, the mathmode is mainly used for

- semantic formulae
- greek letters
- Superscripts and subscripts: X_1^{α} (`X$_1^\alpha$`)
- Primes for intermediate projections or intermediate traces in syntax: t″, X′ (`t$''$, X$'$`)

The most important symbols are summarized in the chart "LaTeX-mathmode for linguists".

LaTeX mathmode for linguists (and others)

GREEK LETTERS

character	code	character	code
A	A	α	α
B	B	β	β
Γ	Γ	γ	Γ
Δ	Δ	δ	δ
E	E	ϵ	ϵ
		ε	ε
Z	Z	ζ	ζ
H	H	η	η
Θ	Θ	θ	θ
		ϑ	ϑ
I	I	ι	ι
K	K	κ	κ
Λ	Λ	λ	λ
M	M	μ	μ
N	N	ν	ν
Ξ	Ξ	ξ	ξ
O	O	o	o
Π	Π	π	π
		ϖ	ϖ
P	P	ρ	ρ
		ϱ	ϱ
Σ	Σ	σ	σ
		ς	ς
T	T	τ	τ
Υ	Υ	υ	υ
Φ	Φ	ϕ	ϕ
		φ	φ
X	X	χ	χ
Ψ	Ψ	ψ	ψ
Ω	Ω	ω	ω

MATHACCENTS

character	code	character	code
$\acute{a}$	$\acute{a}$	$\underline{a}$	$\underline{a}$
$\grave{a}$	$\grave{a}$	$\overline{a}$	$\overline{a}$
$\ddot{a}$	$\ddot{a}$	$\bar{a}$	$\bar{a}$
$\dot{a}$	$\dot{a}$	$\vec{a}$	$\vec{a}$
$\check{a}$	$\check{a}$	$\tilde{a}$	$\tilde{a}$
$\hat{a}$	$\hat{a}$	$\breve{a}$	$\breve{a}$
$\overleftarrow{a}$	$\overleftarrow{a}$	$\overrightarrow{a}$	$\overrightarrow{a}$

NUMBER SETS

character	meaning	code
$\mathbb{N}$	natural numbers	\mathbb{N}[1]
$\mathbb{Z}$	integers	\mathbb{Z}[1]
$\mathbb{Q}$	rational numbers	\mathbb{Q}[1]
$\mathbb{R}$	real numbers	\mathbb{R}[1]

ARITHMETIC OPERATORS

character	meaning	code
$a+b$	addition	$a+b$
$a-b$	subtraction	$a-b$
$a:b$	division	$a:b$
a/b	(mostly fractions)	a/b
$a \div b$		$a\div b$
$\frac{a}{b}$		$\frac{a}{b}$
$a \bmod b$	modulo	$a\ \textrm{mod}\ b$
$a \cdot b$	multiplication	$a\cdot b$
$a \times b$	(mostly no symbol)	$a\times b$
$a \pm b$	plus-minus character	$a\pm b$
$a \oplus b$	direct sum	$a\oplus b$
$a \otimes b$	tensor product	$a\otimes b$

EQUATION CHARACTERS

character	meaning	code
$a = b$	equation	$a=b$
$a \neq b$	inequation	$a\neq b$
$a \equiv b$	identity	$a\equiv b$
$a \approx b$	approximation	$a\approx b$
$a \sim b$	proportionality, equivalence	$a\sim b$
$a \widehat{=} b$	corresponds to	$a\widehat{=}b$
$A : B$	A defined by B	$A:B$
$A := B$	A identical by definition B	$A:=B$

COMPARISON

character	meaning	code
$a < b$	less than	$a<b$
$a > b$	more than	$a>b$
$a \leq b$	less or equal	$a\leq b$
$a \geq b$	more or equal	$a\geq b$
$a \ll b$	much less than	$a\ll b$
$a \gg b$	much more than	$a\gg b$

RELATIONS AND FUNCTIONS

character	meaning	code
$\|a\|$	absolute value	$\|a\|$
$\sqrt{a}$	root	$\sqrt{a}$
$\sqrt[n]{a}$	n-th root	$\sqrt[n]{a}$
$a\%$	percent	$a\%$
$\sum_{i=1}^{n} x_i$	sum	$\sum\limits_{i=1}^{n}$ x_i
$\prod_{i=1}^{n} x_i$	product	$\prod\limits_{i=1}^{n}$ x_i
$a_n \to a$	limit, mapping (sets)	$a_n\to a$
$f : x \mapsto y$	mapping (elements)	$f: x\mapsto y$
∞	infinity	∞
$f \circ g$	chain of functions	$f\circ g$
f^{-1}	inverse function	f^{-1}
$a \prec b$	predecessor	$a\prec b$
$a \succ b$	successor	$a\succ b$
R^+	transitive closure	R^{+}
R^*	reflexive transitive closure	R^{*}
$n!$	factorial	$n!$
$\binom{n}{k}$	binomial coefficient	$\binom{n}{k}$[2]

BRACKETS

character	meaning	code	character	meaning	code	character	meaning	code
(a)	round	(a)	$[a]$	square (*features*)	$[a]$	$\{a\}$	curly (*sets*)	$\{a\}$
$\langle a \rangle$	angle	$\langle a\rangle$	$[\![a]\!]$	double square (*denotation*)	$\llbracket a\rrbracket$[3]	$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$	big brackets	$\left[...\right]$

ARROWS

char.	code	char.	code	char.	code	char.	code
$\rightarrow$	$\rightarrow$	$\leftarrow$	$\leftarrow$	$\leftrightarrow$	$\leftrightarrow$	$\mapsto$	$\mapsto$
$\longrightarrow$	$\longrightarrow$	$\longleftarrow$	$\longleftarrow$	$\longleftrightarrow$	$\longleftrightarrow$	$\longmapsto$	$\longmapsto$
$\Rightarrow$	$\Rightarrow$	$\Leftarrow$	$\Leftarrow$	$\Leftrightarrow$	$\Leftrightarrow$	$\leftrightarrows$	$\leftrightarrows$[1]
$\Longrightarrow$	$\Longrightarrow$	$\Longleftarrow$	$\Longleftarrow$	$\Longleftrightarrow$	$\Longleftrightarrow$	$\leadsto$	$\leadsto$[4]
$\nrightarrow$	$\nrightarrow$[1]	$\nleftarrow$	$\nleftarrow$[1]	$\nleftrightarrow$	$\nleftrightarrow$[1]	$\curvearrowleft$	$\curvearrowleft$[1]
$\nRightarrow$	$\nRightarrow$[1]	$\nLeftarrow$	$\nLeftarrow$[1]	$\nLeftrightarrow$	$\nLeftrightarrow$[1]	$\curvearrowright$	$\curvearrowright$[1]
$\uparrow$	$\uparrow$	$\downarrow$	$\downarrow$	$\updownarrow$	$\updownarrow$	$\circlearrowleft$	$\circlearrowleft$[1]
$\Uparrow$	$\Uparrow$	$\Downarrow$	$\Downarrow$	$\Updownarrow$	$\Updownarrow$	$\circlearrowright$	$\circlearrowright$[1]
$\nearrow$	$\nearrow$	$\nwarrow$	$\nwarrow$	$\hookleftarrow$	$\hookleftarrow$	$\rightsquigarrow$	$\rightsquigarrow$[1]
$\searrow$	$\searrow$	$\swarrow$	$\swarrow$	$\hookrightarrow$	$\hookrightarrow$	$\leftrightsquigarrow$	$\leftrightsquigarrow$[1]
$\dashrightarrow$	$\dashrightarrow$[1]	$\dashleftarrow$	$\dashleftarrow$[1]				

MATRICES

character	code
$(v_1, \ldots, v_n)$	$(v_1, \dots, v_n)$
$\begin{pmatrix} v_1 \\ \vdots \\ v_m \end{pmatrix}$	$\left(\begin{matrix} v_1\\ \vdots\\ v_m \end{matrix}\right)$
$\begin{pmatrix} v_{11} & \dots & v_{1n} \\ \vdots & \ddots & \vdots \\ v_{m1} & \dots & v_{mn} \end{pmatrix}$	$\left(\begin{matrix} v_{11} & \dots & v_{1n}\\ \vdots & \ddots & \vdots\\ v_{m1} & \dots & v_{mn} \end{matrix}\right)$

SETS

character	meaning	code
$\emptyset$	empty set	$\emptyset$
$\{a, b, c, ...\}$	list notation set	$\{a,b,c,...\}$
$\{a \mid T(a)\}$, $\{a : T(a)\}$	property notation set	$\{a\mid T(a)\}$, $\{a: T(a)\}$
$A \cup B$	union	$A\cup B$
$\bigcup_{i=1}^{n} M_i$		$$\bigcup\limits_{i=1}^{n} M_i$$
$A \cap B$	intersection	$A\cap B$
$\bigcap_{i=1}^{n} M_i$	intersection	$\bigcap\limits_{i=1}^{n} M_i$
$A \setminus B$	difference	$A\setminus B$
$A \times B$	Cartesian product	$A\times B$
$\bar{A}$	complement	$\bar{A}$
$\mathcal{P}(A)$	power set	$\mathcal{P}(A)$
$a \in A$, $a \notin A$	(not) in	$a\in A$, $a\notin A$
$A \ni a$, $A \not\ni a$	(does not) contain	$A\ni a$, $A\not\ni a$
$A \subset B$, $A \not\subset B$	(no) true subset of	$A\subset B$, $A\not\subset B$
$A \supset B$, $A \not\supset B$	(no) true superset of	$A\supset B$, $A\not\supset B$
$A \subseteq B$, $A \not\subseteq B$	(no) subset of	$A\subseteq B$, $A\not\subseteq B$
$A \supseteq B$, $A \not\supseteq B$	(no) superset of	$A\supseteq B$, $A\not\supseteq B$

LOGICS

character	meaning	code
$\emptyset$	empty set	$\emptyset$
$A \wedge B$	conjunction	$A\land B$
$A \vee B$	disjunction	$A\lor B$
$A \leftrightarrow B$	log. equivalence	$A\leftrightarrow B$
$A \rightarrow B$	implication	$A\rightarrow B$
$\neg A$	negation	$\lnot A$
$\forall x$	universal quantifier	$\forall x$
$\exists x$	existential quantifier	$\exists x$
$A \vdash B$	derivability relation	$A\vdash B$
$A \models B$	illation	$A\models B$
$A \top$	tautology	$A\top$
$A \bot$	contradiction	$A\bot$
$A \therefore B$	deduction (A therefore B)	$A\therefore B$[1]
$A \because B$	deduction (A because B)	$A\because B$[1]
$\blacksquare$, $\square$	q.e.d.	$\blacksquare$[1], $\Box$
$\Diamond A$	possibly	$\lozenge$[2]
$\Box A$	necessarily	$\square$[2]

[1] Requires package `amssymb`.
[2] Requires package `amsmath`.
[3] Requires package `stmaryrd`.
[4] Requires package `latexsym`.

1.13 Hyphenation

Hyphenation

Hyphenation in LaTeX happens automatically most of the time. For English, the default settings are fine. For other languages, the package `babel` with the respective language option should be included. `\usepackage[ngerman]{babel}`[1em]

Enforce hyphenation

If LaTeX doesn't know a word, the word will not be hyphenated. But there is a possibility to tell LaTeX possible points for hyphenation:

Without hyphenation, some German words can screw up the look of your document: Grundstücksverkehrsgenehmigungszus

(`Grundstücksverkehrsgenehmigungszuständigkeitsübertragungsverordnung`)

With hyphenation, German words are beautiful: Grundstücksverkehrsgenehmigungszuständigkeitsübertragungsverordnung

(`Grund\-stücks\-ver\-kehrs\-ge\-neh\-mi\-gungs\-zu\-stän\-dig\-keits\-über\-tra\-gungs\-ver\-ord\-nung`)

Attention!: If you set one hyphenation point, this overrides all other possible hyphenation points. Thus, you should set all possible points.

Avoid hyphenation

To avoid hyphenation (or line breaks in general), you can draw an invisible box around the word (or text):

Without a box, this joke is not really funny: Grammar doesn't correct Chuck Norris. Chuck Norris corrects Grammar.

(`Grammar doesn't correct Chuck Norris. Chuck Norris corrects Grammar.`)

With a box, this joke is hilarious as fck: Grammar doesn't correct Chuck Norris. Chuck Norris corrects Grammar.

(`\mbox{Grammar doesn't correct Chuck Norris. Chuck Norris corrects Grammar.}`)

(`http://www.chucknorrisfacts.com/search/node/grammar`)

1.14 Colors

Colors

In LaTeX you can use different colors. To do so, the package `xcolor` must be included:
`\usepackage[dvipsnames]{xcolor}`

- background color: `\pagecolor{color}`
- text color: `\textcolor{color}{text}` (within a line, no line breaks possible) `\color{color}` (a switch, everything afterwards will appear in this color)
- text background: `\colorbox{color}{text}`
- colored frame around the text: `\fcolorbox{frame color}{background color}{text}`
- colors can be defined: `\definecolor{name}{rgb}{value red (0.0-1.0), value green (0.0-1.0), value blue (0.0-1.0)}`

Colors `xcolor`

Colors without the option `[dvipsnames]`

black	darkgray	gray	lightgray
cyan	blue	violet	purple
magenta	red	orange	yellow
green	brown	white	

Colors with the option `[dvipsnames]`

Yellow	Salmon	SkyBlue	GreenYellow
Goldenrod	Lavender	Turquoise	SpringGreen
Dandelion	CarnationPink	ProcessBlue	YellowGreen
Apricot	Thistle	CornflowerBlue	LimeGreen
Melon	VioletRed	Aquamarine	Green
Peach	Rhodamine	TealBlue	ForestGreen
YellowOrange	Magenta	BlueGreen	OliveGreen
Orange	WildStrawberry	Cyan	PineGreen
BurntOrange	RubineRed	Cerulean	SeaGreen
RedOrange	OrangeRed	RoyalBlue	JungleGreen
Red	RedViolet	NavyBlue	Emerald
Maroon	Mulberry	CadetBlue	Black
Bittersweet	Plum	Blue	Gray
Brickred	DarkOrchid	MidnightBlue	White
Mahogany	Orchid	BlueViolet	
RawSienna	Purple		
Sepia	Fuchsia		
Brown	RoyalPurple		
Tan	Violet		
	Periwinkle		

1.15 figures, tables, and floating objects

figures
To include graphics and pictures, the package `graphicx` is needed:
`\usepackage{graphicx}`

In the document, you need the following command:

`\includegraphics[width=width]{name file}` `\includegraphics[scale=factor]{name file}`

The picture file should be in the same folder as the tex file. If not, the file path should be specified: `path/file`.

pdfLaTeX can handle the formats `jpg`, `png`, and `pdf`. LaTeX needs the format `eps`.

A frame around the graphics can be drawn with the command `\framebox` or `fbox`.
`\fbox{\includegraphics[width=width]{name file}}`

Tables
Tables are defined in the environment `tabular`:

This is
a table

```
\begin{tabular}[t]{ll}
This & is\\
a & table
```

This	is
a	table

```
\begin{tabular}[t]{|l||l|}
\hline
This & is\\
\cline{1-1}
a & table\\
\hline
\end{tabular}
```

Tables: explanations

The argument contains the alignment of the columns in the table. The number of columns results from the number of alignments:

- `l`: left-aligned column, width determined by widest cell
- `c`: centered column, width determined by widest cell
- `r`: right-aligned column, width determined by widest cell
- `p{width}`: fixed width; might induce line breaks; justified columns
- `|`: before or after the alignment, produces a separation line between columns
- `t,c,b`: optional argument about the vertical alignment of the table in the respective line: top, center or bottom
- `&`: shift to the next column
- `\\`: line break
- `\hline`: separation line between rows in all columns
- `\cline{from-till}`: separation line between rows starting in column `<from>` until `<till>`

Tables: hacks

- `\multicolumn{number}{alignment}{content}`: command conflates two cells into one within a row; if you set the number to 1, you can use the command to redefine the alignment for a single cell
- `\multirow{number}{alignment}{content}`: command conflates two cells into one within a column; requires the package `multirow`
- `\cellcolor{color}`: changes the background color of the cell; requires the package `colortbl`
- `\begin{tabular}{alignment:alignment}`: produces a vertical, dashed line between columns; requires the package `arydshln`
- `\hdashline`: produces a horizontal dashed line; requires the package `arydshln`

This	is
a	table

Table 1.1: The first table

Figure 1.1: The first figure

Floating objects
Tables and graphics can be put in environment for floating objects, thereby receiving a caption and the possibility for a label. Tables and figures are numbered consecutively.
Code for table 1.1:

```
\begin{table}
\begin{tabular}{|l|l|}
\hline
This & is\\
\hline
a & table\\
\hline
\end{tabular}
\caption{The first table}
\label{tab1}
\end{table}
```

Code for figure 1.1:

```
\begin{figure}
\includegraphics[width=3cm]{wordle.png}
\caption{The first figure}
\label{abb1}
\end{figure}
```

Floating objects: positions
The position of a floating object is chosen automatically in LaTeX. They float to a place in the text that has the room for it. You can specify preferences for the position with optional arguments: `\begin{table}[position_1, position_2, ...]`/ `\begin{figure}[position_1, position_2, ...]`

- `h`: the object can appear (*here*) in this very spot
- `t`: the object can appear at the *top* of a page
- `b`: the object can appear at the *bottom* of a page
- `p`: the object can appear on a special column or page
- `!`: can follow `h`, `t`, `b` and increases the priority of the preference

Attention!: These are only preferences, not positions

Floating objects: table of contents
A list of all tables and figures, which are floating objects, can be produced (mostly after the table of contents):
`\listoffigures`
`\listoftables`

1.16 Comments and Output

Comments
LaTeX allows for comments in the code with a % placed in front of the comment. A comment is a note that is only visible in the input file. You can use them for any kind of notes, for explanations of the code, or for notes for other users of this input file:

```
This is the code %This is the comment
%The comment always ends at the end of the line:
%Still a comment
not anymore
```

Output of code
Sometimes (like in a LaTeX tutorial) it can be useful to have LaTeX code in the output file. The output contains the code as it appears in the input file.

As environment:

```
\begin{verbatim}
...
\end{verbatim}
```

In a line: `\verbSeparationCharacterCodeSeparationCharacter`

Output of code: Tips

- In a `verbatim` environment, you have to do line breaks manually.
- The `verbatim` environment and `\verb` cannot be used as arguments of commands, e.g. in a table with `\multicolumn`.

  Solution: If code has to be in an argument, you can put it in font command `\texttt{Code}`. Special characters require their commands here.
- The seperation character in `\verb` can be any kind of non letter character. Most often, you would use `\verb+Code+` or `\verb|Code|`. The separation character should not be part of the code, of course.
- Formatting of code can be done with the package `listings`. Here, the environment `lstlisting` replaces `verbatim` and `\lstinline` replaces `\verb`. (`http://texdoc.net/texmf-dist/doc/latex/listings/listings.pdf`)

1.17 Some Last Tips

Your own commands
The best thing about LaTeX is that you can define your own commands and overwrite existing commands. This can save a lot of writing and avoid copy-and-paste mistakes:

```
\documentclass{article}
\usepackage{...}
...
\newcommand{\commandname}[number obl. arg.][default for opt. arg]{definition}
...
\renewcommand{\commandname}[number obl. arg.][default for opt. arg]{definition}
...
\begin{document}
... \commandname{argument 1}
\end{document}
```

Your own commands: example

```
\newcommand{\tcr}[1]{\textbf{\textcolor{Maroon}{#1}}}
%#i refers to the i-th obl. arg
...

This is normal text. \tcr{This is the text using the command} \lstinline|\tcr|\tcr{.}
```

This is normal text. **This is the text using the command \tcr.**

The package `microtype`

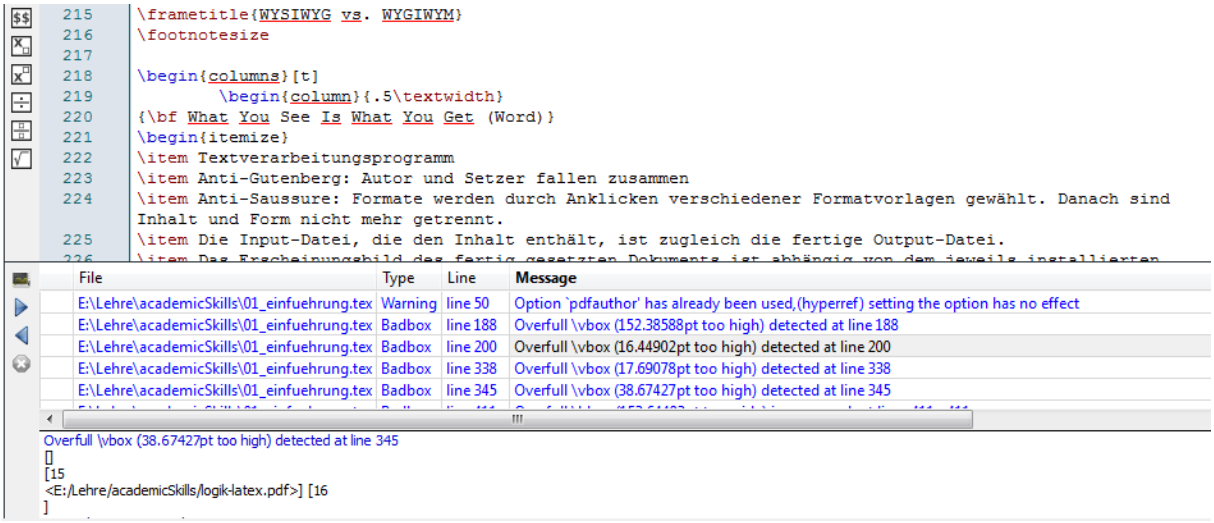
With the package `microtype`, you can save some space (for example in abstracts). The packages optimizes spacing between word, thereby possibly saving a couple of lines.

The package can appear somewhere in the preamble.

Alarms: warnings

LaTeX knows two kinds of alarms: *errors* und *warnings*.

Warnings:



Alarms: warnings

- comments by LaTeX about things that didn't work out as planned, e.g. wrong references, change of the font for some characters if the main font cannot display them, overfull pages or boxes, etc.
- These warnings do not cause a crash of the compilation: The PDF is produced normally.
- As for warnings, you cannot, will not, or don't have to do something. Warnings, that refer to wrong references, however, should be fixed because the reference will appear as a question mark or the wrong reference in the output. Usually, you can avoid these warnings by making sure you
  1. don't have ambiguous labels
  2. you have a label for every reference.
- *Special Tip:* Make sure to compile your document **twice** to get all references and the table of contents right.

Alarms: errors

Alarms: errors

- Errors are true problems which cannot be ignored by the compiler: The output file is not produced at all or with mistakes. You should fix all errors.
- Errors are marked with an exclamation mark in front of the error and are marked red in most LaTeX editors. Additionally, you get a line number that more or less correctly points to the place in the code where the error occured.

Typical errors and how to repair them

- **! Undefined control sequence**: A command is unknown to LaTeX. Most often this is due to a typo in the command which can be fixed easily. Sometimes it is due to missing package.
- **! Missing $ inserted.**: A part of the code should have been put into mathmode. Put this part in `$ $`.
- **! Extra }, or forgotten \endgroup.**: An environment was not closed. The error occurs if you started an environment with `\begin`, but didn't finish it with the respective `\end` command. Can also occur if you accidentally put in an extra curly bracket somewhere.
- **! Missing } inserted.**: A span started with `{` is not closed. (Opposite to the last error.)
- **! Extra alignment tab has been changed to \cr.**: In a table, there are more cells in a row than columns in the definition of the table. Very often, you simply forgot the line break or you lost count of `&` if you have a lot of empty cells.
- **! LaTeX Error: \begin{[...]} on input line ... ended by ...**: Here, you forgot to close an environment (often `tabular`).
- **! LaTeX Error: File '[...].sty' not found.**: A package or a document class was not found, either due to a typo or the package is not in the LaTeX library yet and has to be installed manually.
- **! No room for a new \dimen .**: To many packages. TeX, actually, only has 256 register places. The number can be increased by including the package `\usepackage{etex}` right after the document class.

Ordering packages
We have already seen how packages are included:

```
\usepackage{Paketname}
```

Sometimes, errors are caused by the incompatibility of the packages in the preamble. In these cases, it might help to change the order of the packages. The package `hyperref` should be included as late as possible.

In rare cases, you have to install a package manually. Here are some links how to do that for different operating systems:

- MikTeX: http://www.chemieonline.de/forum/archive/index.php/t-106567.html
- MacTeX: http://tex.stackexchange.com/questions/84118/installing-new-style-packages-on-a-mac
- TeXLive: http://fff2.at/drupal/content/manuelle-installation-eines-latex-paketes

LaTeX vs. pdfLaTeX
There are, in principal, two ways to produce a PDF output from a TeX input:

1. PDFLaTeX: The fast way which converts a tex file directly into a PDF. It's not compatible with all commands and packages (e.g. `psttricks`). It can process the picture formats jpg, png, and pdf.

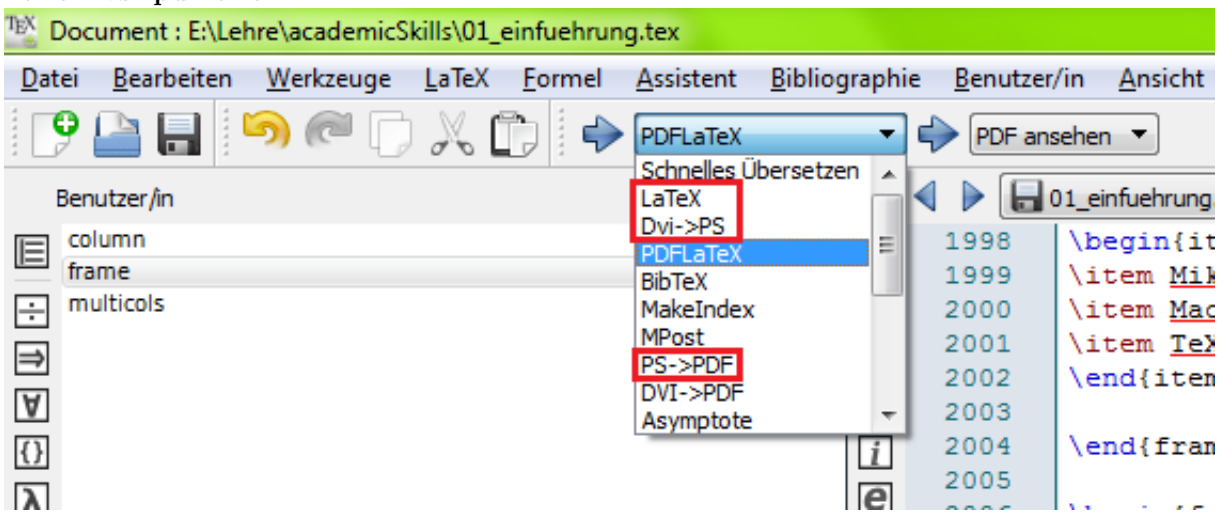
   Number of compilation commands: 1 (PDFLaTeX)

2. LaTeX: The slow way which converts a tex file into a dvi file first. Afterwards, this file must be converted into a PS file, which in turn is converted into a PDF (via Ghostscript). Some packages show problems or don't work at all (e.g. `hyperref`, `tikz`). It can process only the picture format eps.

   Number of compilation commands: 3 (LaTeX, DVI→PS, PS→PDF)

Conclusion: If possible, you should use PDFLaTeX. If you cannot avoid using LaTeX, it is a good idea to learn the shortcut keys for the commands. (These can be different from editor to editor.)

LaTeX vs. pdfLaTeX



Shortcut keys for TeXMaker:

- PDFLaTeX: F6
- LaTeX: F2
- DVI→PS: F4
- PS→PDF: F8
- PDF ansehen: F7

More useful links

https://www.tu-chemnitz.de/urz/archiv/kursunterlagen/latex_fortgeschr/rsrc/latex2a.pdf

http://de.wikibooks.org/wiki/LaTeX-Kompendium

http://homepage.ruhr-uni-bochum.de/Alexander.Linke-2/linguistik/LaTeX/downloads/latex_fuer_linguisten.pdf

Chapter 2

Presentations with LaTeX

2.1 General Remarks about Presentations

Pros and Cons of Presentations
Pros:

- You can control the focus of the audience.
- You can make improvements until the talk starts.
- You can easily incorporate video and audio files.
- You save paper if you don't print out the slides.

Cons:

- You are tempted to look at the screen instead of the audience.
- The screen might be difficult to read from if (i) the colors are badly chosen, (ii) the room is too bright.
- Your success also depends on technics.
- Your audience cannot independently look back at previous slides if you don't print out the slides.

Dos and don'ts of presentations
Dos:

- Use the cursor of your mouse or a laser pointer: Guide the view of your audience to the most important elements
- Provide tables of contents: In the beginning of your presentation (maybe after the claim) and in the beginning of every section, there should be a slide with the table of contents (with the title of the current section highlighted) or just the title of the section. This tells your audience where they are in the presentation.
- PDF files as presentations: This guarantees that your presentation works on every computer.

Donts:

- Lots of odds and ends: Ideally no animations, not too many overlays, no sound effects
- Overfull slides: You should not project a handout
- (Nearly) empty slides: It is okay to have brief explanations etc. for important elements on the slides. (This helps people to understand the slides even without a presentation.
- Moving too fast through the slides: You should give your audience some time for every slide.
- Only looking at the screen: Every now an than (ideally all the time) you should look at your audience.

2.2 The beamer class of LaTeX

Nice presentations with LaTeX
The great thing about LaTeX is that you can make handouts as well as presentations. With a few simple commands, you can even convert your presentation into a handout.

The beamer class of LaTeXhelps avoiding a lot of common problems with presentations by

- providing professional templates
- an automatic font size correction (can be adapted manually)
- making animated slide changes difficult (depending on the PDF viewer)
- producing a PDF file that is stable

Two things
We already learned how LaTeXworks. For presentations, you only have to change two things:

1. choose the document class `beamer`
2. Put the content in separate `frames`:

```
\begin{frame}

\end{frame}
```

You should keep in mind that the document class `beamer` includes a different set of packages, e.g. `hyperref`.

Skeleton

```
\documentclass[xcolor=dvipsnames]{beamer}
... %packages
\usetheme{Theme} %choose the design
... %other things for the preamble

\begin{document}
%information for the title slide
\author{author\\\texttt{E-Mail}}
\title{Title}
\institute{Affiliation}
\date{Date}

\begin{frame}
\maketitle %makes the title slide
 \end{frame}

\section{Section 1}
\begin{frame} %Environment for the slide
\frametitle{First Slide} %title of the slide
Content first slide %Content of the slide
 \end{frame}
...
\end{document}
```

2.3 Table of Contents

Table of contents
As shown above, you can use the command `\tableofcontents` to produce a table of contents automatically. This is especially important for presentations because the section titles do not appear as in a handout. The command can be extended with a couple of options.

Present content: Highlight sections one after the other

```
\begin{frame}
\tableofcontents[pausesections]
\end{frame}

\begin{frame}
\tableofcontents[pausesubsections]
\end{frame}
```

Show a new section: Highlight the current section

```
\begin{frame}
\tableofcontents[currentsection]
\end{frame}

\begin{frame}
\tableofcontents[currentsubsection]
\end{frame}
```

Save space: Hide subsections

```
\begin{frame}
\tableofcontents[hideallsubsection]
\end{frame}
```

Insert table of contents automatically
If you want to insert the table of contents after every section or subsection, you can do this automatically with the following code:

```
...
\AtBeginSection[]
{
  \begin{frame}
        \begin{multicols}{2}
    \frametitle{Table of contents}
    \tableofcontents[currentsection]
    \end{multicols}
  \end{frame}
}
\AtBeginSubsection[]
{
  \begin{frame}
        \begin{multicols}{2}
    \frametitle{Table of contents}
    \tableofcontents[currentsection,currentsubsection]
    \end{multicols}
  \end{frame}
}
```

2.4 Special layout elements of the beamer class

Multicolumn slide

This way, the text appears in

- two,
- three,
- or more columns

```
\begin{columns}[b] %vertical alignment: [b]ottom, [t]op [c]enter
\begin{column}{.5\textwidth}
This way, the text appears in
\end{column}
\begin{column}{.5\textwidth}
\begin{itemize}
\item two,
\item three,
\item or more columns
\end{itemize}
\end{column}
\end{columns}
```

Blocks

This is a
block.

This is an
alert block.

This is an
example block.

```
\begin{block}{This is a}
block.
\end{block}

\begin{alertblock}{This is an}
alert block.
\end{alertblock}

\begin{exampleblock}{This is an}
example block.
\end{exampleblock}
```

2.5 Overlays

Overlays: `pause`
Overlays allow you to control which parts of the slide are visible at a certain point.

The simplest way to procude an overlay is the command `\pause`.

```
\begin{frame}
First there is little ...\\[2em]

\pause
... than there is more!

\end{frame}
```

Overlay: Example `pause`

First there is little ...

... than there is more!

Cons of `pause`

The biggest con about the `\pause`-command is that you cannot have an overlay in the middle of the slide.

This is possible with overlay specifications.

This is not possible with `\pause`.

Overlay specifications

An overlay specification is `<number>` added after a command. The numbers specify at which points the respective elements are visible.

Overlay specifications: Example visibility

```
\begin{itemize}
\item<1> Element only on the first overlay.
\item<2-> Element starting on the second overlay.
\item<1,3> Element only on the first and third overlay.
\item<-2> Element until the second overlay.
\item<1-2,4> Element on overlay 1 til 2, and on overlay 4.
\end{itemize}
```

Note: If you want to pop up items one after the other, you can use: `\begin{itemize}[<+->]`.

Overlay specifications: Example visibility

- Element only on the first overlay.
- Element starting on the second overlay.
- Element only on the first and third overlay.
- Element until the second overlay.
- Element on overlay 1 til 2, and on overlay 4.

Overlay specifications: Example formatting

```
\begin{lstlisting}
\begin{itemize}
\item \alert<1> Formatting only on the first overlay.
\item \alert<2-> Formatting starting on the second overlay.
\item \alert<1,3> Formatting only on the first and third overlay.
\item \alert<-2> Formatting until the second overlay.
\item \alert<1-2,4> Formatting on overlay 1 til 2, and on overlay 4.
\end{itemize}
```

Overlay specifications: Example formatting

```
\begin{lstlisting}
\begin{itemize}
\item \alert<1> Formatting only on the first overlay.
\item \alert<2-> Formatting starting on the second overlay.
\item \alert<1,3> Formatting only on the first and third overlay.
\item \alert<-2> Formatting until the second overlay.
\item \alert<1-2,4> Formatting on overlay 1 til 2, and on overlay 4.
\end{itemize}
```

Overlay specifications for formatting

`\textbf<2>{Text}`	**Text**
`\textit<2>{Text}`	*Text*
`\emph<2>{Text}`	*Text*
`\textsl<2>{Text}`	*Text*
`\textrm<2>{Text}`	Text
`\textsf<2>{Text}`	Text
`\color<2>{green} Text`	Text
`\textcolor<2>{green}{Text}`	Text

Special commands for overlay specifications

Command	Use	Space for hidden text?
`\onslide<1>{Text1}`	The text appears only on the specified overlays. The commands is a switch without any arguments.	yes
`\visible<1>{Text1}`	The text appears only on the specified overlays.	yes
`\invisible<1>{Text1}`	Opposite of `\visible`.	yes
`\uncover<1>{Text1}`	The text appears only on the specified overlays.	yes
`\only<1>{Text1}`	The text appears only on the specified overlays.	no
`\alt<1>{Text1}{Text2}`	Text 1 appears only on the specified overlays, otherwise Text 2 appears.	no
`\temporal<1>{Text1}{Text2}{Text3}`	Text 2 appears only on the specified overlays. Text 1 appears before, and Text 3 afterwards.	no

Overlays with `onslide`

Example

This text appears first.

This text appears afterwards.

```
\onslide<1>{This text appears first.\\\vspace*{1em}}

\onslide<2>{This text appears afterwards.}
```

Overlays with `visible`

Example
This text appears first.

This text appears afterwards.

```
\visible<1>{This text appears first.\\\vspace*{1em}}

\visible<2>{This text appears afterwards.}
```

Overlays with `invisible`

Example

```
\invisible<2>{This text appears first.\\\vspace*{1em}}

\invisible<1>{This text appears afterwards.}
```

Overlays with `uncover`

Example
This text appears first.

This text appears afterwards.

```
\uncover<1>{This text appears first.\\\vspace*{1em}}

\uncover<2>{This text appears afterwards.}
```

Overlays with `only`

Example
This text appears first.

This text appears afterwards.

```
\only<1>{This text appears first.\\\vspace*{1em}}

\only<2>{This text appears afterwards.}
```

Overlays with `alt`

Example
This text appears first.

```
\alt<2>{This text appears first.}{This text appears afterwards.}
```

Overlays with `temporal`

Example
This text appears afterwards.

```
\temporal<2>{This text appears first.}{This text appears afterwards.}{This text
    appears in the end.}
```

Overlays: Tips

- Overlays can be very effective and increase the audience's understanding. You should, however, only use them where they are effective. Too many overlays can disturbe the presentation.
- There is an option to show hidden text in a half-transparent formatting. It's used quite often. However, in the end, this option undermines the effect of overlays because the focus of the audience is suddenly on the hidden text.
- If you print out your slides, you can use the class option `handout`. With this option, the content is printed without overlays. This saves a lot of paper.

```
\documentclass[handout,xcolor=dvipsnames]{beamer}
```

- **Attention!**: Concerning the class option `handout`, the commands for overlay specifications behave differently. In any ccase, you should go over the "handout" and change the commands if you did not get the right result.

2.6 Split Frames

Too much content
Sometimes, it happens that you have too much content for one slide, but you don't want to manually divide the slide into many slides.

Here you can use the option `allowframebreaks`:

```
\begin{frame}[allowframebreaks]
\frametitle{Frametitle}

...

\end{frame}
```

Notes:

- Frame breaks will be done automatically when the frame is full.
- You get multiple slides. Each slide has the same frame title but is suffixed with a Roman number (i.e. "Frametitle I", "Frametitle II", "Frametitle III", etc.)
- You can do manual frame breaks with `\pagebreak`.
- If you use `[allowframebreaks]`, overlays of any kind (`\pause`, `\onslide<\#>`, ...) will not work anymore. So you need to decide for doing different frames or for manual overlays (by page breaks and copying text).

2.7 Video- and Audio Files

Including video and audio files
Presentation are perfect to play videos or audio files during the talk. Until December 2020, you could include mpeg files with the package `media9`.

Unfortunately, the package is build on Flash, which has been discontinued since December 2020. **So, currently, there is no way to include audio and video files in the PDF directly.**

If you want to click on something in your PDF to start playing the file, you can upload files to your website or YouTube channel and include a link in the PDF.

```
To see more look at this file:

\url{https://youtu.be/Gp1EhIBTRe4}
```

To see more look at this file:
https://youtu.be/Gp1EhIBTRe4

The rest of this section is only for reference.

```
%audio files
\includemedia[Option1,Option2,...,addresource=filename.MP3,
  flashvars={source=filename.MP3]{Text}{APlayer.swf}
%video files
\includemedia[Option1,Option2,...,addresource=filename.MP4,
  flashvars={source=filename.MP4]{Text}{VPlayer.swf}
```

Including video and audio files: Examples

Figure 2.1: The most-sold song of all times

http://www.party-megahits.de/erfolgreiche-lieder/

Including video and audio files: Examples
http://diepresse.com/home/kultur/film/537487/index

Including video and audio files: Youtube

Figure 2.2: The most successful movie of all times (inflation-adjusted)

```
\includemedia[
  width=0.8\linewidth,height=0.3\linewidth
  ]{}{https://www.youtube.com/v/1DIwXd_SmVU} %URL instead of file and player
```

Attention!:

- If you copy the url of a youtube video, you get: `https://www.youtube.com/watch?v=number` To find the file, you have to modify the last part of the url: `https://www.youtube.com/v/number`
- Be careful with copy rights and make sure that you are allowed to use the video.

Including video and audio files: Notes

- To play a file in the pdf, you need to install the Flash-PlugIns for Adobe Reader: `https://helpx.adobe.com/de/acrobat/using/flash-player-needed-acrobat-reader.html`
- The players `APlayer.swf` and `VPlayer.swf` are provided by `media9`.
- The file names or paths of `addresource` and `source` must be identical.
- More tips: `http://mirror.hmc.edu/ctan/macros/latex/contrib/media9/doc/media9.pdf`
- Before every talk, you should make sure that all the files are working. In this case, it's best to use your own computer.

2.8 Design: Themes

There is (no) accounting for taste
In LaTeX, you can choose from many design templates. But you can also put together your own design.

As for the templates, you can decide 5 points:

1. presentation theme: Basic layout of the slides
2. Color theme
3. Font theme
4. Inner theme: title page, section slides, enumerations, blocks, pictures, tables, footnotes, references
5. Outer theme: Header, footer, sidebars, logo, frame title

Overview over all themes:
`http://deic.uab.es/~iblanes/beamer_gallery/index.html`

Code
All the commands for the design should appear in the preamble.

```
...
\usetheme[options]{Theme}
\usefonttheme[options]{fonttheme}
\usecolortheme[options]{colortheme}
\useinnertheme[options]{innertheme}
\useoutertheme[options]{outertheme}
...
\begin{document}
...
\end{document}
```

For a list of possible options, see:
`http://www.matthiaspospiech.de/latex/vorlagen/beamer/preambel/beamer-settings/`

Further settings
You can also modify every element on its own.

```
\setbeamercolor{name element}{bg=background color, fg=foreground color}

\setbeamertemplate{name element}[options]{settings}
```

Übersicht: `http://www.matthiaspospiech.de/latex/vorlagen/beamer/preambel/beamer-settings/`

2.9 Converting slides into a handout

Handout vs. slides
Many people prefer to have a handout additionally to the presentation. The way this handout should look is a matter of taste.

3 options:

1. keep the layout of the slides
2. reduce the layout of the slides
3. produce the layout of a handout

Keeping the layout
This is the easiest option. Importantly, there should not be any overlays in the handout.

```
\documentclass[handout,xcolor=dvipsnames]{beamer}
...
```

You should always check whether all information are in the handout. If not, the overlay commands should be modified.

Layout of slides: Pros and Cons
Pros:

- The audience can move from the screen to the handout and back very easily.
- During the discussion, the audience can easily point at certain places in the slides.

Cons:

- Depending on the color scheme, the handout might be difficult to read
- Depending on the amount of text on a slide, it might waste a lot of paper

Reducing the layout
If you want to avoid the presentation design in your handout, you have to define all respective commands as belonging to the beamer mode. This way, you can change colors and elements, but the slides still appear in single frames.

```
\documentclass[handout,xcolor=dvipsnames]{beamer}
...
\mode<beamer>{
\usetheme{Theme}
...
}
...
\begin{document}
...
\mode<beamer>{
\AtBeginSubsection[]
{
  ...
}
}
...
}
```

Reducing the layout
To save some paper, you can put several slides on one page. To do so, you start a new tex file with the following content.

```
\documentclass[a4paper]{article}
\usepackage{pdfpages}

\begin{document}
\includepdf[pages=1-last,nup=2x2,landscape=true,frame=true,noautoscale=false,scale
    =0.9,delta=0mm 5mm]{mypresentation.pdf}

\end{document}
```

The PDF input is the respective presentation. The option `2x2` produces 4 slides per page. The number can be adapted.

New layout
By changing the document class, you can produce a "real" handout. You only have to add some modifications to the preamble.

Attention!: Most often, you have to correct some things manually.

Handoutlayout
Presentation

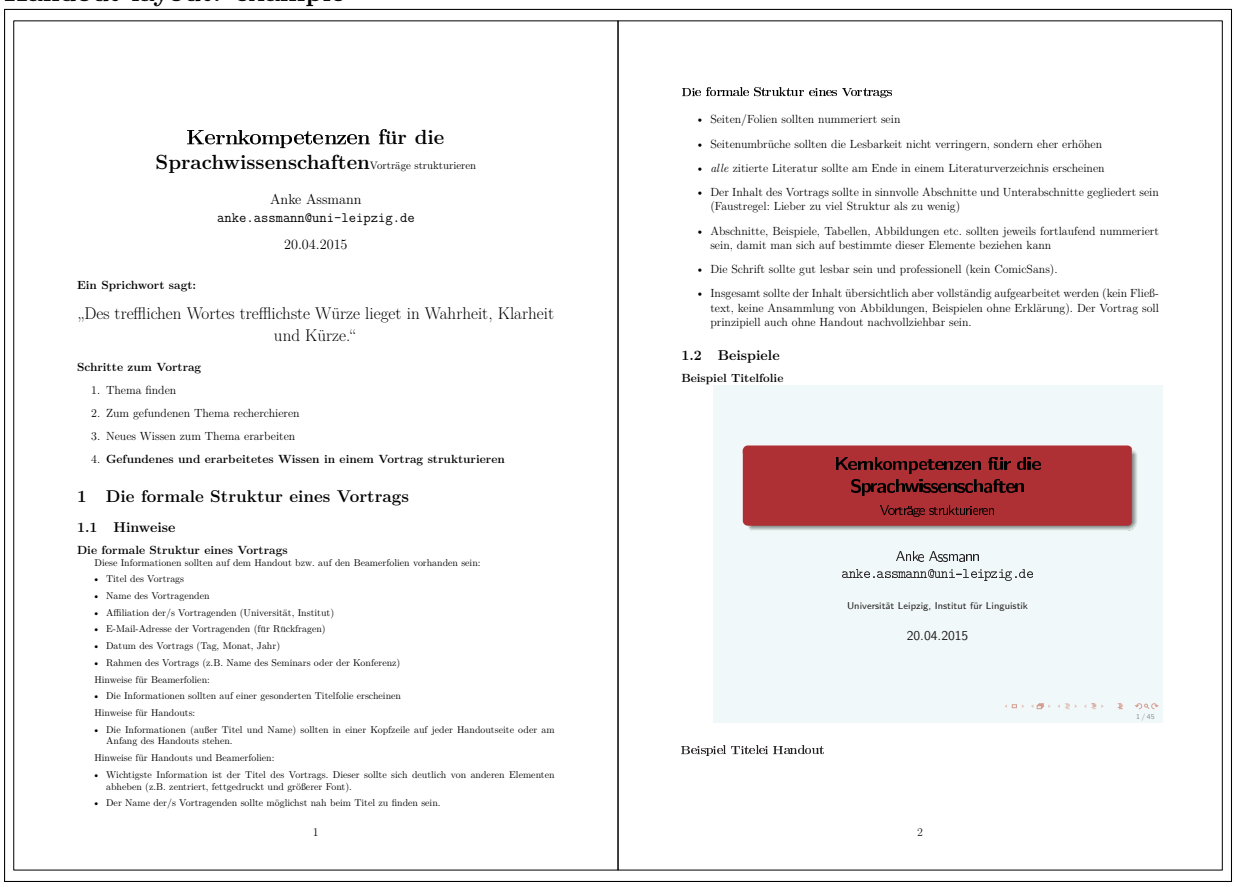
```
\documentclass[xcolor=dvipsnames]{beamer}
\usepackage{package}
...
\mode<beamer>{
\usetheme{theme}
...
}
\newcommand{\mycommand}{definition}
...
\begin{document}
...
```

```
\end{document}
```

Handout

```
\documentclass[12pt]{article} %document class is "article" or "scrartcl"
\usepackage{beamerarticle} %package to deal with frame environments
\usepackage[a4paper,margin=margin]{geometry} %define a new margin to fit more on one
    page (optional)
\usepackage{package} %All the packages from the presentation
...
\usepackage{hyperref} %include hyperref manually
\mode<beamer>{
\usetheme{theme}
...
}
\newcommand{\mycommand}{definition}
...
\begin{document}
... %The content is identical to the presentation
\end{document}
```

Handout layout: example



Kernkompetenzen für die Sprachwissenschaften Vorträge strukturieren

Anke Assmann
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20.04.2015

Ein Sprichwort sagt:

„Des trefflichen Wortes trefflichste Würze lieget in Wahrheit, Klarheit und Kürze."

Schritte zum Vortrag

1. Thema finden
2. Zum gefundenen Thema recherchieren
3. Neues Wissen zum Thema erarbeiten
4. **Gefundenes und erarbeitetes Wissen in einem Vortrag strukturieren**

1 Die formale Struktur eines Vortrags

1.1 Hinweise

Die formale Struktur eines Vortrags

Diese Informationen sollten auf dem Handout bzw. auf den Beamerfolien vorhanden sein:

- Titel des Vortrags
- Name des Vortragenden
- Affiliation der/s Vortragenden (Universität, Institut)
- E-Mail-Adresse der Vortragenden (für Rückfragen)
- Datum des Vortrags (Tag, Monat, Jahr)
- Rahmen des Vortrags (z.B. Name des Seminars oder der Konferenz)

Hinweise für Beamerfolien:

- Die Informationen sollten auf einer gesonderten Titelfolie erscheinen

Hinweise für Handouts:

- Die Informationen (außer Titel und Name) sollten in einer Kopfzeile auf jeder Handoutseite oder am Anfang des Handouts stehen.

Hinweise für Handouts und Beamerfolien:

- Wichtigste Information ist der Titel des Vortrags. Dieser sollte sich deutlich von anderen Elementen abheben (z.B. zentriert, fettgedruckt und größerer Font).
- Der Name der/s Vortragenden sollte möglichst nah beim Titel zu finden sein.

1

Die formale Struktur eines Vortrags

- Seiten/Folien sollten nummeriert sein
- Seitenumbrüche sollten die Lesbarkeit nicht verringern, sondern eher erhöhen
- *alle* zitierte Literatur sollte am Ende in einem Literaturverzeichnis erscheinen
- Der Inhalt des Vortrags sollte in sinnvolle Abschnitte und Unterabschnitte gegliedert sein (Faustregel: Lieber zu viel Struktur als zu wenig)
- Abschnitte, Beispiele, Tabellen, Abbildungen etc. sollten jeweils fortlaufend nummeriert sein, damit man sich auf bestimmte dieser Elemente beziehen kann
- Die Schrift sollte gut lesbar sein und professionell (kein ComicSans).
- Insgesamt sollte der Inhalt übersichtlich aber vollständig aufgearbeitet werden (kein Fließtext, keine Ansammlung von Abbildungen, Beispielen ohne Erklärung). Der Vortrag soll prinzipiell auch ohne Handout nachvollziehbar sein.

1.2 Beispiele

Beispiel Titelfolie

Kernkompetenzen für die Sprachwissenschaften
Vorträge strukturieren

Anke Assmann
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Universität Leipzig, Institut für Linguistik

20.04.2015

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Beispiel Titelei Handout

2

Links

https://www.uncg.edu/cmp/reu/presentations/Charles%20Batts%20-%20Beamer%20Tutorial.pdf

http://www.physik.uni-freiburg.de/~tooleh/latex_beamerkurs.pdf

http://deic.uab.es/~iblanes/beamer_gallery/

http://www.matthiaspospiech.de/latex/vorlagen/beamer/preambel/beamer-settings/

Chapter 3

Linguistic Examples with LaTeX

3.1 Basics

In general

- Linguistic examples, especially glosses, can be displayed nicely with LaTeX.
- The consecutive numbering happens automatically.
- There are different packages for example environments, e.g. `gb4e` or `linguex`.
- Below, the use of `linguex` is shown: `http://texdoc.net/texmf-dist/doc/latex/linguex/linguex-doc.pdf`.

3 commands
There are 3 important commands in `linguex` for examples:

- `\ex.`: starts the top level for examples (numbering (1), (2), ...)
- `\a.`: starts a lower level for examples (numbering a., b., ... or (i), (ii), ...)
- `\b.`: continues the respective level

Example

(1) This is the first level of embedding
   a. This is the second level
   b. This is still the second level, but:
      (i) This is the third level
      (ii) This is not the end.
      (iii) This is the end

```
\ex. This is the first level of embedding
    \a. This is the second level
    \b. This is still the second level, but:
        \a. This is the third level
        \b. This is not the end.
        \b. This is the end
```

Blank lines
`linguex` is sensitive for blank lines in the editor. Errors are generated if

- there is no blank line after the `\ex.`-environment
- there is a blank line somewhere inside the `\ex.`-environment

Tip:
Two blank lines after the `\ex.`-environment result in an indentation of the following paragraph.

a til z

- `\a.` start a new lower level
- `\b.` continues the level
- `\c.`, `\d.`, `\e.`, `\f.` are synonyms for `\b.`
- `\z.` closes the lower level without closing the entire example, `\z.` is not followed by an example

example

(2) This is the first level of embedding
  a. This is the second level
  b. This is still the second level
  c. This is still the second level, but:
    (i) This is the third level
    (ii) This is not the end.
  d. This is the second level again

```
\ex. This is the first level of embedding
    \a. This is the second level
    \b. This is still the second level
    \c. This is still the second level, but:
        \a. This is the third level
        \b. This is not the end.
        \z. %This is the end of the third level
    \d. This is the second level again
```

3.2 Labels and References

Referring to examples: `label` and `ref`
Examples have a number which you can refer to.

- `\label{Label}`: Every element of every level can carry a label. The `\label`command must appear between the command for the target element and the next example command.
- `\ref{Label}`: Is used normally.

  Attention!: References by a `\ref` command to element of a lower level also give you the numbers of the higher levels (e.g. (4-a-i))

Referring to examples: Special commands
Quite often you refer to the preceding or the following example. For comfort, `linguex` offers special commands. These however are not true references, they only give you the number of the counter.

- `\Next`: Gives you the next example number
- `\NNext`: Gives you the example number following the next example number
- `\Last`: Gives you the last example number
- `\LLast`: Gives you the example number before the last example number
- **Attention!:** Within an example environment, `\Last` refers to the current environment and `\LLast` refers to the last environment

(3) The last example is (3)

```
\ex. The last example is \Last
```

Referring to examples: Example 1
In (4), (5-a), and (5-b), we see some examples.

(4) This is the first example.

(5) a. This is the second example.
b. This is the third example.

```
In \ref{ex1}, \ref{ex2}, and \ref{ex3}, we see some examples.

\ex.\label{ex1} This is the first example.

\ex. \a. \label{ex2} This is the second example.
        \b. This is the third example.\label{ex3}
```

Referring to examples: Examples 2
In (6), (7-a), and (7-b), we see examples.

(6) This is the first example.

(7) a. This is the second example.
b. This is the third example.

```
In \Next, \NNext[a], and \NNext[b], we see examples.

\ex. This is the first example.

\ex. \a. This is the second example.
        \b. This is the third example.
```

Referring to examples: Hacks

- After the commands `\Next`, `\NNext`, `\Last`, and `\LLast`, you can put some text in `[ ]`. This way, you can refer to elements in a lower level.
  Attention!: This does not guarantee correct references.

  See (8-a).

  (8) Here, is the example.

  ```
  See \Next[a].

  \ex. Here, is the example.
  ```

- By default, there is a hyphen between the number of the main level and the number of the lower level. This can be avoided by:
  `\renewcommand{\firstrefdash}{}`
- The commands `\Next`, `\NNext`, `\Last`, and `\LLast` don't produce a hyperlink in the PDF with the package `hyperref`.

3.3 Examples in footnotes

Special things about footnotes

- Examples in footnotes are automatically numbered differently: (i), (ii), ... For every footnote, a new numbering starts.
- The command `\Next` produces the next number in the footnote.

- If you want to refer to the next example in the main text, you need the command `\TextNext`.
- Within an example environment, you cannot have a footnote containing a blank line. Such footnotes have to be done with `footnotemark` in the example environment and `\footnotetext{}` outside of the environment.

```
\ex. My examples
       \a. First Example\footnotemark
       \b. Second Example

\footnotetext{My footnote ...

... needs a break}
```

3.4 Glossing

Glossing
To gloss examples, you have to add a `g` after the respective command (e.g. `\exg.`, `\ag.`, etc.)

```
\ex.\a. No gloss
    \bg. Dies ist die erste Glosse\\
              this is the first gloss\\
         'This is the first gloss.'

\exg. Dies ist nicht die erste Glosse\\
     this is not the first gloss\\
     'This is not the first gloss.'
```

(9) a. No gloss
b. Dies ist die erste Glosse
this is the first gloss
'This is the first gloss.'

(10) Dies ist nicht die erste Glosse
this is not the first gloss
'This is not the first gloss.'

Glossing with `gll`
If you want to have a heading before the glossing, you need the command `\gll`:

```
\ex. \emph{This is the heading}
        \gll Dies ist nicht die erste Glosse\\
         This is not the first gloss\\
         'This is not the first gloss.'
```

(11) *This is the heading*

Dies ist nicht die erste Glosse
This is not the first gloss

'This is not the first gloss.'

Attention!: Using `\gll` comes with an extra vertical space between the glossing and the translation. This can be manually corrected with a negative `\vspace`.

Glossing: Tips

- The glossing has to be done manually. You should always adhere to the *Leipzig Glossing Rules*:
  `https://www.eva.mpg.de/lingua/pdf/LGR08.02.05.pdf`

- Certain elements should not appear in glosses, e.g. brackets. You can insert `{}` as an empty gloss.
- If, against the Leipzig Glossing Rules, a word in the example corresponds to several words in the glosses or vice versa, you can combine several words with `{ }`.

(12) Dies ist nicht die erste Glosse
This is not the first gloss
'This is not the first gloss.'

```
\exg. {Dies ist nicht} {die erste Glosse}\\
        {This is not} {the first gloss}\\
        'This is not the first gloss.'
```

Glossing: Tips

- The glossing option requires two line breaks, or there will be an error. But you do not have to write anything in the translation line.

  (13) Dies ist nicht die erste Glosse
  This is not the first gloss

  ```
  \exg. Dies ist nicht die erste Glosse\\
          This is not the first gloss\\
  ```

- A space after a special character command (esp. `tipa` commands) does not produce a space after the character. In these cases, the alignment of glosses can be off. This can be avoided by putting the special characters in curly brackets (e.g. `h{\ae} n{\textupsilon}p`)

3.5 Judgments

Grammatical judgments
The characters `* ? # %` are automatically put in front of the example, including the glosses.

(14) *Dies ist nicht die erste Glosse
This is not the first gloss
'This is not the first translation.'

```
\exg. *Dies ist nicht die erste Glosse\\
     This is not the first gloss\\
     'This is not the first translation.'
```

3.6 Bracket structures

Bracket structures

- Using `\exi.` instead of `\ex.`, the text after an opening square bracket until the first space is subscript. This can be useful for syntactic structures.
- This option holds for the entire example environment. You cannot add it separately for lower levels.
- An alternative for subscripting after a square bracket is the use of `\I`.
- Glossing and bracket structures can be combined by using `\exig.` or `\exgi.`
- **Attention!:** Within `\exi.` environments `\vspace` commands are useless. If you need `\vspace`, you should use `\I`.

Bracket structures: examples

(15) [$_{CP}$ Heute [$_{C'}$ scheint [$_{TP}$ [$_{DP}$ die Sonne] [$_{VP}$ t_V]]
today shines the sun

(16) [$_{Prefield}$ Morgen [$_{Left\ sentence\ bracket}$ regnet [$_{middle\ field}$ es]]]

```
\exig. [CP Heute [C$'$ scheint [TP [DP die Sonne ] [VP \I{t}V ]]\\
              {} today {} shines {} {} the sun {} {} {}\\

\ex. \I[{Prefield} Morgen \I[{Left~sentence~bracket} regnet \I[{middle~field} es ]]]
```

3.7 Sans serif examples

`linguex` and `beamer`
The document class `beamer` uses a sans serif font by default. The glossing of `linguex`, however, uses a serif font. To change the font for glosses, you have to use the following command lines:

```
\usepackage{helvet} %sanserif font that also has small caps
...
\usepackage{linguex}
%For sans serif in the glosses
\let\eachwordone\sffamily
\let\eachwordtwo\sffamily
\let\eachwordthree\sffamily
```

3.8 Spacing and lengths

Spacing and lengths
Spacing and lenghts for example environments are determined automatically. They can be changed manually with `setlength{\command}{measure}`:

- `\Extopsep`: Spacing above and below example environments (Default: `0.66\baselineskip`)
- `\Exindent`: Space between the example number and the left margin (Default: `0pt`)
- `\Exlabelsep`: Space between the number of the main level and the example (Default: `1.3em`)
- `\SubExleftmargin`: Space between the number of the first sublevel and the example (Default: `2.4em`)
- `\SubSubExleftmargin`: Space between the number of the subsublevel and the example (Default: `2em`)

If you want to return to the default settings, you need to use: `\resetExdefaults`.

3.9 Numbering

Change the numbering
The automatic numbering can be manipulated by `\setcounter{counter}{number}` or `\addtocounter{counter}{number}`.

- `ExNo`: numbering of the main level
- `SubExNo`: numbering of the sublevel
- `SubSubExNo`: numbering of the subsublevel
- `FnExNo`: numbering of the main level in footnotes

Additionally, every example command can bear an optional argument which overwrites the automatic number.

```
\ex.[(1)] This example becomes the first example

\ex.[No number: ] An example without a number
```

(1) This example becomes the first example

No number: An example without a number

Chapter 4

Tables and OT-Tableaux in LaTeX

Basics

Example

	l	c	r	p
This is a table:	flushleft	centered	flushright	parbox

```
 This is a table:
\begin{tabular}[b]{lcrp{4cm}}
l & c & r & p\\
flushleft & centered & flushright & parbox\\
\end{tabular}
```

4.1 Alignment

Horizontal alignment of the cells

- `l`: flushleft, width of the column is determined by the widest cell
- `c`: centered, width of the column is determined by the widest cell
- `r`: flushright, width of the column is determined by the widest cell
- `p{width}`: justified, width of the column is determined by the measure

Example

l	c	r	p
flushleft	centered	flushright	parbox

```
\begin{tabular}{lcrp{4cm}}
l & c & r & p\\
flushleft & centered & flushright & parbox\\
\end{tabular}
```

Vertical alignment of the cells

- `p{width}`: justified column, aligned with the top of the cell
- `m{width}`: justified column, aligned with the center of the cell
- `b{width}`: justified column, aligned with the bottom of the cell

Beispiel

Aligned with the top of the cell.	Aligned with the center of the cell.	Aligned with the bottom of the cell.

```
\begin{tabular}{p{3cm}m{3cm}b{3cm}}
Aligned with the top of the cell. & Aligned with the center of the cell. & Aligned
    with the bottom of the cell.
\end{tabular}
```

Horizontal alignmment of the table

- `\begin{center}\begin{tabular}...\end{tabular}\end{center}`: centered
- `\begin{flushleft}\begin{tabular}...\end{tabular}\end{flushleft}`: flushleft
- `\begin{flushright}\begin{tabular}...\end{tabular}\end{flushright}`: flushright

Example

column 1	column 2	column 3

column 1	column 2	column 3

column 1	column 2	column 3

Vertical alignment of the table

- `\begin{tabular}[b]{columnn}`: aligned with the bottom of the current line
- `\begin{tabular}[t]{columnn}`: aligned with the top of the current line
- `\begin{tabular}[c]{columnn}`: aligned with the center of the current line

Example

These are tables:

1	2	1	2	1	2
3	4	3	4	3	4

4.2 Lines

Vertical lines

- `|`: continuous line between the columns
- `:`: dashed line between columns (requires the package `arydshln`)
- `;{Dashwidth/Gapwidth}` dashed line between columns (requires the package `arydshln`)
- these signs can be stringed together any number of times

Example

1	2	3	4	5
6	7	8	9	10

```
\begin{tabular}{|l||l:l:|l;{1pt/1pt}l|}
1 & 2 & 3 & 4 & 5\\
6 & 7 & 8 & 9 & 10\\
\end{tabular}
```

Horizontal lines between rows

- `\hline`: continuous horizontal line
- `\hdashline[Dashwidth/Gapwidth]`: dashed horizontal line (requires the package `arydshln`)
- these signs can be stringed together any number of times

Example

1	2	3
4	5	6
7	8	9
10	11	12

```
\begin{tabular}{lll}
\hline
1 & 2 & 3\\
\hline\hline
4 & 5 & 6\\
\hdashline\hline
7 & 8 & 9\\
\hdashline[5pt/5pt]\hdashline[1pt/1pt]
10 & 11 & 12\\
\hline
\end{tabular}
```

Horizontal lines between cells

- `\cline{startingcolumn-finishingcolumn}`: continuous horizontal line
- `\cdashline{startingcolumn-finishingcolumn}[Dashwidth/Gapwidth]`: dashed horizontal line (requires the package `arydshln`)

Example

1	2	3
4	5	6
7	8	9
10	11	12

```
\begin{tabular}{lll}
\hline
1 & 2 & 3\\
\cline{1-2}
4 & 5 & 6\\
\cdashline{2-3}
7 & 8 & 9\\
\cdashline{1-1}[1pt/1pt]\cdashline{3-3}[5pt/1pt]
10 & 11 & 12\\
\hline
\end{tabular}
```

4.3 Background color

`colortbl`: column color

Code

```
\columncolor[color model]{color}[left overhang][right overhang]
```

Example

one	two
three	four

```
\begin{tabular}{|>{\columncolor[gray]{.8}[0pt][0pt]}c|>{\color{white}\columncolor[gray
    ]{.3}[4pt][4pt]}c|}
one & two\\
three & four\
\end{tabular}
```

colortbl: row color

Code

```
\rowcolor[color model]{color}
```

Example

one	two
three	four

```
\begin{tabular}{|c|c|}
\rowcolor[gray]{.8} one & two\\
\rowcolor[gray]{.2} \color{white}three & \color{white}four
\end{tabular}
```

colortbl: cell color

Code

```
\cellcolor[color model]{color}
```

Example

one	two
three	four

```
\begin{tabular}{|c|c|}
\cellcolor[gray]{.8} one & \cellcolor[gray]{.6} two\\
\cellcolor[gray]{.4} \color{white}three & \cellcolor[gray]{.2} \color{white}four
\end{tabular}
```

colortbl: Vertical colored lines

Code

```
\color{color}\vline
```

Example

one	two
three	four

```
\begin{tabular}{|c!{\color{green}\vline}c|}
one & two\\
three & four\\
\end{tabular}
```

`colortbl`: **Horizontal colored lines**

Code
`\arrayrulecolor{color}`

Example

one	two
three	four

```
\begin{tabular}{cc}
\hline
\arrayrulecolor{green} one & two\\
\hline
\arrayrulecolor{black} three & four\\
\hline
\end{tabular}
```

4.4 Merging cells

`multicolumn`

Code
`\multicolumn{number}{alignment}{content}`

Example

one	two	three
four		five
six	seven	eight

```
\begin{tabular}{|c|c|c|}
\hline
one & two & three\\
\hline
\multicolumn{2}{|c|}{four} & five\\
\hline
six & seven & eight\\
\hline
\end{tabular}
```

`multirow`

Code
`\usepackage{multirow} ... \multirow{number}{alignment}{content}`

Example

one	two	three
four	five	six
	seven	eight

```
\begin{tabular}{|c|c|c|}
\hline
one & two & three\\
\hline
\multirow{2}{*}{four} & five & six\\
\cline{2-3}
& seven & eight\\
\hline
\end{tabular}
```

4.5 Lengths and Spaces

Column width

Code

```
\setlength{\tabcolsep}{length}
```

Example

one	two	three
four	five	six
seven	eight	nine

```
\setlength{\tabcolsep}{10mm}
\begin{tabular}{|c|c|c|}
\hline
one & two & three\\
\hline
four & five & six\\
\hline
seven & eight & nine\\
\hline
\end{tabular}
```

row height

Code

```
\renewcommand{\arraystretch}{factor}
```

Example

one	two	three
four	five	six
seven	eight	nine

```
\renewcommand{\arraystretch}{2}
\begin{tabular}{|c|c|c|}
\hline
one & two & three\\
\hline
four & five & six\\
\hline
seven & eight & nine\\
\hline
\end{tabular}
```

line width

Code

```
\setlength{\arrayrulewidth}{10pt}
```

Example

one	two	three
four	five	six
seven	eight	nine

```
\setlength{\arrayrulewidth}{10pt}
\begin{tabular}{|c|c|c|}
\hline
one & two & three\\
\hline
four & five & six\\
\hline
seven & eight & nine\\
\hline
\end{tabular}
```

Spaces between lines

Code

```
\setlength{\doublerulesep}{10pt}
```

Example

one	two	three
four	five	six
seven	eight	nine

```
\setlength{\doublerulesep}{10pt}
\begin{tabular}{|c|c|c|}
\hline
one & two & three\\
\hline
four & five & six\\
\hline
seven & eight & nine\\
\hline
\end{tabular}
```

4.6 Text Alignment

Text alignment

For long column title, it can be necessary to align the text vertically. This requires the package `rotating`.

Example

column One	column Two	column Three	column Four
1	2	3	4
5	6	7	8

```
\begin{tabular}{|c|c|c|c|}
\hline
\begin{turn}{90}column One\end{turn} & column Two & \begin{turn}{90}column Three\end{
    turn} & column Four\\
\hline
1 & 2 & 3 & 4\\
\hline
5 & 6 & 7 & 8\\
\hline
\end{tabular}
```

4.7 pifont

Special characters with pifont
The hands you need for OT tableaux require the package `pifont`. The package also includes pretty numberings and arrow for derivation steps:

Important characters

Zeichen	Code	Bedeutung
☞	`\ding{43}`	winner among the candidates
☛	`\ding{42}`	candidate that doesn't win, but should be the winner
✓	`\ding{51}`	
①	`\ding{192}`	
...		
⑩	`\ding{201}`	
...		
❶	`\ding{202}`	
...		
❿	`\ding{211}`	
...		

4.8 OT Tableaux

Example OT tableaux

Example

	/Input/	Constraint 1	Constraint 2	Constraint 3
	a. Output 1	*!		*
☞	b. Output 2			*
☛	c. Output 3		*!	

```
\begin{tabular}{|rl||c|c|c|}
\hline
 & /Input/ & Constraint 1 & Constraint 2 & Constraint 3\\
\hline\hline
 & a. Output 1 & *! & \cellcolor[gray]{.8} & \cellcolor[gray]{.8}*\\
\hline
\ding{43} & b. Output 2 & & & *\\
\hline
\ding{42} & c. Output 3 & & *! & \cellcolor[gray]{.8}\\
\hline
\end{tabular}
```

OT tableaux: symbols

*	violation of a constraint
*!	violation that eliminates a candidate
	shading for unimportant cells (optional)
☞	winner
☛	candidate that should be the winner
dashed line	the two constraints don't have a clear ranking
C1 & C2	local conjunction of two constraints

Chapter 5

Bibliography in LaTeX

Links to examples

- Link to an example bib-file (bibliography file):

  `http://www.ankehimmelreich.de/downloads/bibliothek.bib`

- Link to an example bst-file (bibliography style file):

  `http://www.ankehimmelreich.de/downloads/my-jmr.bst`

Bibliography
A bibliography is a list of the literature that has been used for the work.

Requirements:

- **Correctness:** All the information (especially authors, title, and year) should be correct.
- **Completeness:** All the literature that is referred to (and only this literature) should appear in the bibliography.
- **Uniformity:** All the information should be displayed in the same style. (This also holds for the references in the text.)
- **Clarity:** The bibliography should be a list (hanging indent, line breaks between the entries).
- **Honesty:** Also literature where you found the literature you used should be cited. (But no URLs of Wikipedia articles or so, please.)

(`http://de.wikipedia.org/wiki/Literaturverzeichnis`)

5.1 Basics

Principle
The main goal is to have a list of references that can be used all the time. But in no scientific paper, you cite all the literature you have ever read. That is why in LaTeX, you use two files to make a bibliography:

1. **bibliography file:** a file with the ending `bib`. Here, you can have a potentially endless list of literature.
2. **input file:** a file with the ending `tex`. Here, you use the relevant entries of you bib-file.

Template for the files
The `bib`-file

```
@Typ{lit-key1,
author = {authorlastname 1, authorfirstname 1},
title = {title 1},
year = {year 1}
}

...

@Typ{lit-key2,
author = {authorlastname 2, authorfirstname 2},
title = {title 2},
year = {year 2}
}

...
```

The tex-file

```
\documentclass{article}
...
\usepackage{natbib}
...
\begin{document}

...
\cite{lit-key1}
...
\cite{lit-key2}
...

\bibliographystyle{style}
\bibliography{path/filename}

...

\end{document}
```

Details

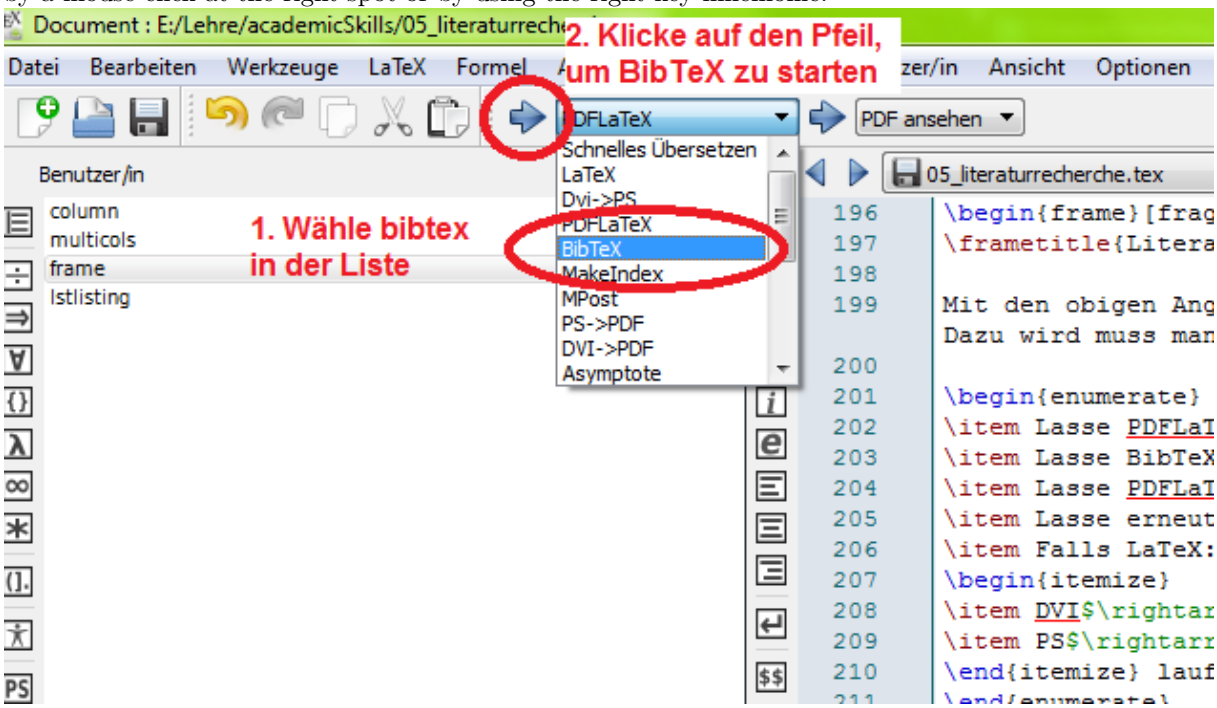
- bib-file: Contains all the literature entries.
- tex-file: Chooses the desired entries by using the command `\cite{}`. Only these entries will appear in the bibliography.
- natbib: A package for bibliographies that allows a lot of modifications and is ideal for linguistics.
- `\bibliographystyle{style}`: Determines the look of the biliography. You can define your own styles.
- `\bibliography{path/filename}`: Includes the biliography in the tex-file. If the bib-file is in the same folder as the tex-file you don't need to declare a path. The file name can be used without the ending `.bib`.

Compiling the bibliography
Just including the commands above does not suffice to produce a bibliography. To do that you have to run the program bibtex:

1. Run PDFLaTeX (or LaTeX).

2. Run BibTeX.
3. Run PDFLaTeX (or LaTeX).
4. Run PDFLaTeX (or LaTeX) again (corrects the references).
5. In case of running LaTeX: Run
   (a) DVI→PS
   (b) PS→PDF

How do I run BibTeX?
If you use a special LaTeXeditor (e.g. TeXMaker), you can run BibTeX just like PDFLaTeX (or LaTeX) by a mouse click at the right spot or by using the right key mnemonic.



BibTeX in TexMaker

Hote keys in TexMaker:

PDFLaTeX: F6

BibTeX: F11

PDF ansehen: F7

LaTeX: F2

DVI→PS: F4

PS→PDF: F8

What happens?
BibTeX uses

- an `aux`-file produced by (PDF-)LaTeX
- a `bst`-file for the bibliography style
- a `bib`-file for the entries

1. BibTeX chooses the entries from the `bib`-file which are specified by cite commands in the `aux`-file.
2. BibTeX writes a `bbl`-file with all chosen entries in the style that is specified by the `bst`-file
3. Another run og (PDF-)LaTeX includes the `bbl`-file in the document.

5.2 The bib-file

Central location
The idea of a separate `bib`-file is that you do not have to start a new bibliography for every project. Instead it is reasonable to have a `bib`-file which collects all the literature you have ever read.

Ideally, the file is located at a central place (e.g. the main directory of your computer (C in Windows), an external storage medium or an online cloud if you often work on different computers).

Advantage: Every alteration in the `bib`-file (e.g. extensions, corrections of typos, ...) can be used in all the projects.

Structure
A `bib`-file is simply a list of literature entries.

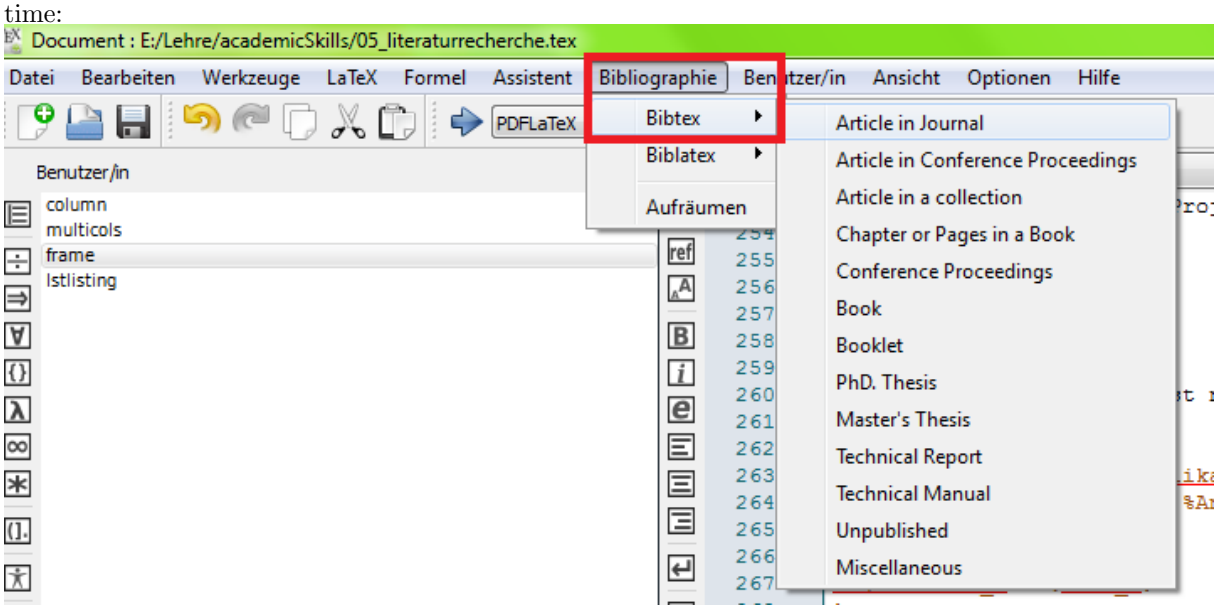
```
@type{key, %The type specifies the publication type, e.g. article, book, ...
%the key is an unambiguous label
property_1 = {value_1}, %information about the literature, e.g. author, title, year,
    ...
property_2 = {value_2},
...
property_n = {value_n}
}
```

"Key Notes"

- The key in the entire `bib`-file must be unique.
- The key should not contain umlaute, "'ß"' or other non-ASCII characters.
- In order to find a unique key, it is recommended to include three pieces of information in the key:
  - author name
  - year of publicatiom
  - a word from the title or a keyword for the publication

  To improve the readability, you can separate the information by the use of "'-"', "':"' or "'/"'

Saving time
Many LaTeXeditors offer a shortcut for the insertion of literature entries by clicking. This saves a lot of time:



Choosing literature entries in TeXMaker

literature entries: article
Use: for publications in journals, e.g. *Linguistic Inquiry*

```
@Article{key,
%obligatory properties
author = {authorlastname, authorfirstname}, %More than one author: lastname, firstname
     and lastname, firstname and ...
title = {title of the article},
journal = {name of the journal},
year = {year of publication},
%optional properties: if used, delete the prefix "OPT", otherwise delete the entire
    line (improves the length of the bib file)
OPTkey = {keywords of the article} %not shown in the PDF, used to sort the bib file
OPTvolume = {number of the journal's volume}, %IMPORTANT
OPTnumber = {number of the issue of the volume},
OPTpages = {pages}, %e.g. 112-134 (IMPORTANT)
OPTmonth = {month of publication},
OPTnote = {note}, % e.g. affiliation of the author
OPTannote = {annotation} % e.g. place of publication (appears only with certain styles
    )
}
```

literature entries: inproceeding
Use: For publications in proceedings of conferences (Collection of article version of the talks), e.g. *Proceedings of NELS*

```
@InProceedings{key,
author = {author},
title = {title of the article},
booktitle = {title of the proceedings}, %e.g. Proceedings of NELS 42
OPTcrossref = {reference to another publication}, %e.g. publication in a journal or a
    collection
OPTkey = {keywords},
OPTpages = {pages}, %IMPORTANT
OPTyear = {year of the publication of the proceedings (not the conference)}, %
    IMPORTANT
OPTeditor = {editorlastname, editorfirstname}, %all editors, just like authors (
    IMPORTANT)
OPTvolume = {number of the volume},
OPTnumber = {number of the issue},
OPTseries = {title of the series},
OPTaddress = {address of the publisher}, %City (+state for American cities) (IMPORTANT
    )
OPTmonth = {month of publication},
OPTorganization = {name of the organization in charge}, %e.g. the department which
    organized the conference
OPTpublisher = {name of the publisher}, %IMPORTANT
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: incollection
Use: For publication in a collection

```
@InCollection{key,
author = {author},
title = {title of the article},
booktitle = {title of the collection},
```

```
OPTcrossref = {reference to another publication},
OPTkey = {keywords},
OPTpages = {pages}, %IMPORTANT
OPTpublisher = {publisher}, %IMPORTANT
OPTyear = {year}, %IMPORTANT
OPTeditor = {editors}, %IMPORTANT
OPTvolume = {volume},
OPTnumber = {number},
OPTseries = {title of series},
OPTtype = {Overwriting publication type},
OPTchapter = {chapternumber},
OPTaddress = {address}, %IMPORTANT
OPTedition = {edition},
OPTmonth = {month},
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: inbook
Use: For chapters or parts of books

```
@InBook{key,
%alternative properties: choose only one, delete the prefix "ALT"
ALTauthor = {authors},
ALTeditor = {editor},
title = {title},
chapter = {chapter number},
publisher = {publisher},
year = {year},
OPTkey = {keywords},
OPTvolume = {number in series},
OPTnumber = {number of books in several parts},
OPTseries = {title series},
OPTtype = {Overwriting the publication type},
OPTaddress = {address}, %IMPORTANT
OPTedition = {edition},
OPTmonth = {month},
OPTpages = {pages}, %IMPORTANT
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: proceedings
Use: For entire proceedings of conferences

```
@Proceedings{key,
title = {title of the proceedings},
year = {year of proceedings},
OPTkey = {keywords},
OPTeditor = {editor}, %IMPORTANT
OPTvolume = {volume},
OPTnumber = {number if several parts},
OPTseries = {title series},
OPTaddress = {address}, %IMPORTANT
OPTmonth = {month},
OPTorganization = {name responsible organization},
OPTpublisher = {publisher}, %IMPORTANT
```

```
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: book
Use: For books

```
@Book{key,
ALTauthor = {author},
ALTeditor = {editor},
title = {title book},
publisher = {publisher},
year = {year},
OPTkey = {keywords},
OPTvolume = {number in series},
OPTnumber = {number if several parts},
OPTseries = {title series},
OPTaddress = {address}, %IMPORTANT
OPTedition = {edition},
OPTmonth = {month},
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: PHDthesis
Use: Dissertations

```
@PhdThesis{key,
author = {author},
title = {title dissertation},
school = {university},
year = {year},
OPTkey = {keywords},
OPTtype = {Overwriting publication type},
OPTaddress = {address university}, %City (+state for American university) IMPORTANT
OPTmonth = {month},
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: Mastersthesis
Use: Master's theses

```
@MastersThesis{key,
author = {author},
title = {title thesis},
school = {university},
year = {year},
OPTkey = {keywords},
OPTtype = {Overwriting the publication type}, %IMPORTANT for BA theses
OPTaddress = {address university}, %IMPORTANT
OPTmonth = month},
OPTnote = {note},
OPTannote = {annotation}
}
```

literature entries: Unpublished
Use: For all papers that don't fit in any of the other schemes, e.g. unpublished papers

```
@Unpublished{key,
author = {author},
title = {title},
note = {note}, %type of publication, e.g. "Ms., Leipzig University" or "lingbuzz/
    number" or URL
OPTkey = {keywords},
OPTmonth = {month}, %Sometimes
OPTyear = {year}, %IMPORTANT
OPTannote = {annotation}
}
```

Synonyms for properties
There are several alternatives for writing properties. They all mean the same:

```
...
author = {author},
...
author = "author",
...
AUTHOR = {author},
...
AUTHOR = "author",
...
```

bib-files and special characters
Using UTF-8 in your document allows you to have non-ASCII characters in your bib-file as well. However, to guarantee full compatibility with all tex files, you better use LaTeX-commands for all those special characters, including umlauts in German. The commands should be put in curly brackets.

Choosing a bib-style which does not reproduce titles as written in the entries, you can put upper case letters in curly brackets.

```
@PhdThesis{rezac:2004:elements,
author = {{\v{R}}ez{\'a}{\v{c}}, Milan},
title = {{E}lements of {C}yclic {S}yntax: {A}gree and {M}erge},
school = {University of Toronto},
year = {2004}
}
```

Making bib-files with TeXMaker: Tips

- If you click on publication types in TeXMaker, all values are first set with "·". This character has to be deleted and replaced by a value. With the tab key on your keyboard, you can jump to the next ·.
- With a click on the menu entry "Bibliography→Clean", all empty properties are deleted automatically. (The `bib`-file is "cleaned").

5.3 The tex-file

Preamble

```
%For German talks/papers
\usepackage[ngerman]{babel}
...
%package that contains all the cite commands and bib-styles
\usepackage{natbib}
...
%choosing the bib-style, e.g. jmr, my-jmr, or styles from packages like apacite,
    geralpha
\bibliographystyle{style}
%Settings for the special characters (optional)
\bibpunct[: ]{(}{)}{;}{a}{}{,}
%Setting the spacing between bibliography entries (optional)
\setlength{\bibsep}{0.25\baselineskip}
%Setting the font size of the bibliography (optional)
\renewcommand{\bibfont}{\footnotesize}
%Changing the "and" between two authors (default = "and")
\newcommand{\harvardand}{\&}
```

bibpunct

```
\bibpunct[1]{2}{3}{4}{5}{6}{7}
```

1. separation character for additions to cite commands
2. type of sign before the year
3. type of sign after the year
4. separation signs for between references
5. citation form:
   - `n`: number
   - `s`: superscript number (vgl. Wikipedia)
   - `a`: author and year (recommended)
6. separation sign between author and year
7. separation sign between several years

Predefined `cite`-commands

The package `natbib` offers a number of cite commands:

- `\cite{key}`: e.g. **?**
- `\cite[page]{key}`: e.g. (**?**, 123)
- `\citet{key}`: e.g. **?**
- `\citet[page]{key}`: e.g. **?**, 123
- `\citep{key}`: e.g. (**?**)
- `\citep[page]{key}`: e.g. (**?**, 123)
- `\citealt{key}`: e.g. **?**
- `\citealt[page]{key}`: e.g. **?**, 123
- `\citeauthor{key}`: e.g. **?**
- `\citeauthor[page]{key}`: e.g. **?**, 123
- `\citeyear{key}`: e.g. **?**
- `\citeyear[page]{key}`: e.g. **?**, 123

Define new `cite`-commands
With the `natbib`-commands, you can define your own cite-commands:

```
...
\newcommand{\scite}[1]{\citeauthor{#1}'s (\citeyear{#1})}
...
\begin{document}
...
\scite{chomsky:1995:the} definition of ...
...
\end{document}
```

Example
?'s (?) definition of ...

Using `cite`-commands
There can be several keys in one `\cite`-command. The keys are separated by commas. In the output file, the predefined separation character (defined by `\bibpunct`) appears. If you cite several papers by one author, the author's name only appears once.

Beispiel
?????

```
\cite{chomsky:1981:lectures, chomsky:1986:barriers, chomsky:1995:the, halle:1993:
    distributed, noyer:1997:features}
```

Autocomplete
Many LaTeX editors offer an autocomplete function for commands, labels and keys of `bib`-entries.

Tips for TeXMaker:

- If the autocomplete function doesn't kick in, open the bib file in TexMaker.
- The autocomplete function only works for the commands `\cite` and `\citep`. If you want to use it, you should first use the command `\cite` and change the command name after the key is found.
- Autocomplete only works with `\cite`-commands after the opening bracket.
- Other editors (e.g. LEd) offer a better autocomplete function.

Bibliography styles
`natbib` is compatible with the standard styles and the styles of the package. The styles for linguistics should have the following properties:

- alphabetic sorting
- author-year referencing

Beispiele: `my-jmr`, `jmr`

Hacks

- If you want to have entries in your bibliography that haven't been specified by `\cite`-commands, you can use `\nocite` instead.
- `\nocite{*}` gives you all the entries of the bib-file.
- You can manually alter the `bbl`-file. However, all alterations are overwritten as soon as you run `bibtex` again.

- If you use the document class `beamer`, you should place the command `\bibliography` in a frame with the option `[allowframebreaks]`. In this case, the bibliography is split on several slides if needed.

```
\begin{frame}[allowframebreaks]
\frametitle{References}
\bibliography{bib-file}
\end{frame}
```

5.4 Bibliographies with Biblatex

Biblatex
Besides the still valid standard BibTeX, multiple alternatives have been developed to create bibliographies. The most important one is the package `biblatex`.

The most important advantage of `biblatex` is that you can adapt the format (the bibliography style) easier.

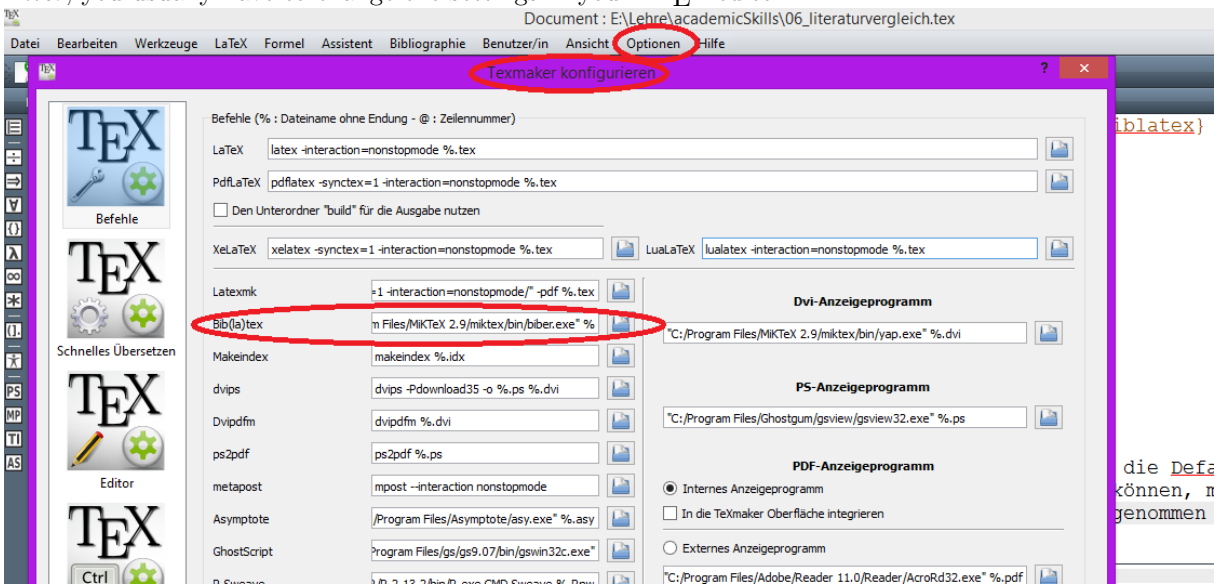
`biblatex` is still quite new and has not become the standard yet.

Template
The `bib`-file is done the same way as for BibTeX.

`tex`-file:

```
...
\usepackage[style=authoryear-comp,backend=bibtex]]{biblatex} %authoryear für
    Linguistik, backend-Alternative biber
\addbibresource{bib-file.bib}
...
\begin{document}
...
\printbibliography
\end{document}
```

Backend
As for the Bib-program you can use BibTeX verwenden or the default option *Biber*. To be able to use *Biber*, you usually have to change the settings in your LaTeX editor.



Settings of the Bib program in TeXMaker

cite-commands
With biblatex there are sometimes different cite-commands:

- \cite{chomsky:1986:barriers}: ?
- \parencite{halle:1993:distributed}: (?)
- Referenz\footcite{kager:1999:optimality}: Referenz[1]
- \textcite{mueller:1998:incomplete}: ?
- \citeauthor{levinson:2000:pragmatik}: ?
- \citeyear{nevins:2009:piraha}: ?

biblatex und natbib
To use the special cite-commands of the package natbib you need the package option [natbib=true].

```
...
\usepackage[style=authoryear-comp,backend=bibtex,natbib=true]]{biblatex}
...
```

Possible commands:

- \citet{chomsky:1986:barriers}: ?
- \citep{chomsky:1986:barriers}: (?)
- \citealt{chomsky:1986:barriers}: ?
- \citealp{chomsky:1986:barriers}: ?

Adapt the bib style
To adapt the bibliography style, you use LaTeX commands in the preamble. The basic settings of the styles are done via package options.

For an overview, see: http://ctan.math.washington.edu/tex-archive/macros/latex/contrib/biblatex/doc/biblatex.pdf

[1] ?

Chapter 6

KOMAScript: Easier formatting in LaTeX

What is KOMAScript?
KOMAScript is a bundle of different document classes and packages that allow more formatting than the standard document classes.

For information, see: `http://texdoc.net/texmf-dist/doc/latex/koma-script/scrguien.pdf`

Document classes

Standard class	KOMA class
`article`	`scrartcl`
`book`	`scrbook`
`report`	`scrreprt`

Notes: The basic settings of the KOMA classes differ in some aspects from the standard classes.

Important class options

- a*X*`paper`: paper size, e.g. a4, a5
- `oneside`: all pages are treated differently (for term papers)
- `twoside`: there is a difference between the left and the right page (for BA/MA/PhD dissertations)
- `titlepage`: title is on a separate page
- `notitlepage`: title is not on a separate page
- *X*`pt`: font size, you can choose any size
- `smallheadings`: font size of headings is small
- `normalheadings`: font size of headings is medium
- `bigheadings`: font size of headings is big
- `bibtotoc`: bibliography appears in the table of contents
- `bibtotocnumbered`: bibliography appears in the table of contents with a section number
- `abstracton`: `abstract`-environment contains the headings “Abstract”

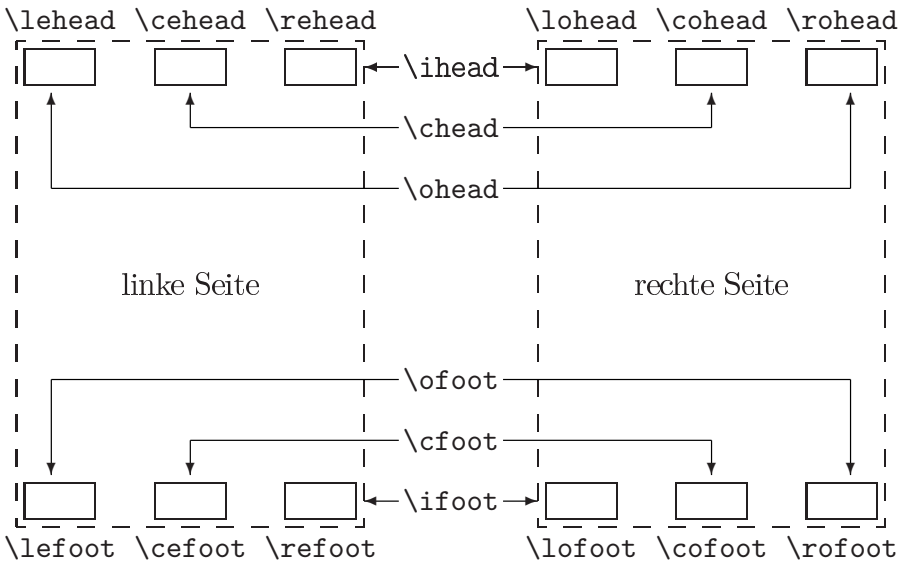
Changing fonts
The font and the formatting of certain elements (e.g. headings) can be changed easily.

```
\setkomafont{element}{command}
```

Important elements: caption, chapter, section, ..., subparagraph, footnote, pagenumber, title, subtitle, pagefoot, pagehead

Important commands: \normalfont, \bfseries, \itshape, \sffamily, \rmfamily, \scshape, \Huge, ... \tiny

Headers and Footers
\pagestyle{\scrheadings}



Headers and Footers

Headers and Footers

```
\lehead[scrplain-left-even]{scrheadings-left-even}
\cehead[scrplain-centered-even]{scrheadings-centered-even}
\rehead[scrplain-right-even]{scrheadings-right-even}
\lefoot[scrplain-left-even]{scrheadings-left-even}
\cefoot[scrplain-centered-even]{scrheadings-centered-even}
\refoot[scrplain-right-even]{scrheadings-right-even}
\lohead[scrplain-left-odd]{scrheadings-left-odd}
\cohead[scrplain-centered-odd]{scrheadings-centered-odd}
\rohead[scrplain-right-odd]{scrheadings-right-odd}
\lofoot[scrplain-left-odd]{scrheadings-left-odd}
\cofoot[scrplain-centered-odd]{scrheadings-centered-odd}
\rofoot[scrplain-right-odd]{scrheadings-right-odd}
\ihead[scrplain-inside]{scrheadings-inside}
\chead[scrplain-centered]{scrheadings-centered}
\ohead[scrplain-outside]{scrheadings-outside}
\ifoot[scrplain-inside]{scrheadings-inside}
\cfoot[scrplain-centered]{scrheadings-centered}
\ofoot[scrplain-outside]{scrheadings-outside}
```

Commands for the content

```
\headmark %column title

\pagemark %page mark
```

Links

http://www.stud.uni-leipzig.de/fsr-linguistik/HA.pdf

http://texdoc.net/texmf-dist/doc/latex/koma-script/scrguien.pdf

Chapter 7

Structures, Graphs, and Pictures in LaTeX with TikZ

TikZ ist kein Zeichenprogramm
With TikZ, you don't draw pictures, you program them.
For every part of the picture, you use a command to say

- what should be drawn
- where it should be drawn

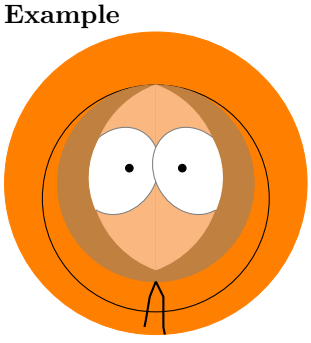
As for linguistics, TikZ is mainly used for

- nodes
- node connections
- labels

With these three things you can display

- autosegmental representations in phonology
- syntactic trees
- graphs of any kind

Example



```
\begin{tikzpicture}
%orange hood
\draw [orange,fill=orange] (0,0) circle [radius=2];
%black line
\draw [black] (0,-0.2) circle [radius=1.5];
%brown inner lining
\draw [brown,fill=brown] (0,0) circle [radius=1.3];
%face left part
\draw [Apricot,fill=Apricot] (0,1.3) arc [radius=1.3, start angle=110, end angle=250];
```

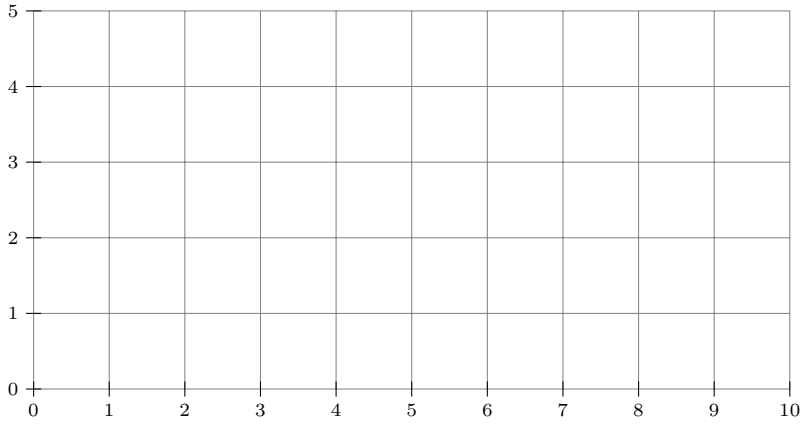
```
%face right part
\draw [Apricot,fill=Apricot] (0,1.3) arc [radius=1.3, start angle=70, end angle=-70];
%left eye
\draw [gray,fill=white, rotate around={-30:(0,0)}] (-0.5,-0.1) ellipse (0.5cm and 0.6
    cm);
%right eye
\draw [gray,fill=white, rotate around={30:(0,0)}] (0.5,-0.1) ellipse (0.5cm and 0.6cm)
    ;
%covering brown inner lining left eye
\draw [brown,fill=brown] (-0.75,0.65) arc [radius=0.55, start angle=110, end angle
    =244];
%covering brown inner lining right eye
\draw [brown,fill=brown] (0.75,0.65) arc [radius=0.55, start angle=70, end angle=-64];
%adaption curve left eye
\draw [white,fill=white] (-0.74,0.6) arc [radius=1.05, start angle=150, end angle
    =204];
%adaption curve right eye
\draw [white,fill=white] (0.74,0.6) arc [radius=1.05, start angle=30, end angle=-24];
%left pupil
\draw [black,fill=black] (-0.35,0.2) circle [radius=0.05];
%right pupil
\draw [black,fill=black] (0.35,0.2) circle [radius=0.05];
%left ribbon
\draw [black,thick] (0,-1.3) -- (-0.08,-1.5) -- (-0.13,-1.8) -- (-0.15,-1.9);
%right ribbon
\draw [black,thick] (0,-1.3) -- (0.1,-1.5) -- (0.1,-1.9) -- (0.12,-2);
\end{tikzpicture}
```

General scheme

```
...
\usepackage{tikz}
\usepackage{pgflibraryshapes} %for further options, e.g. ovals
...
\begin{document}
...
\begin{tikzpicture}
%Every command must end in a semicolon
command;
command;
command;
\end{tikzpicture}
...
\end{document}
```

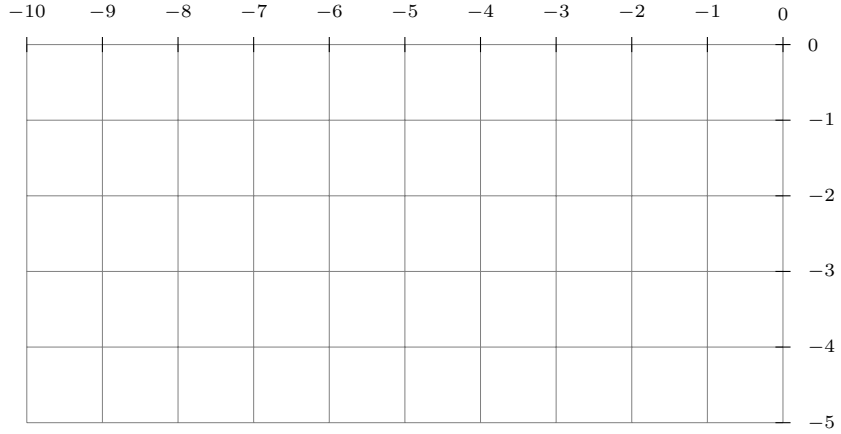
Grid

The positions of single elements of a picture are determined by positions in a coordinate system.



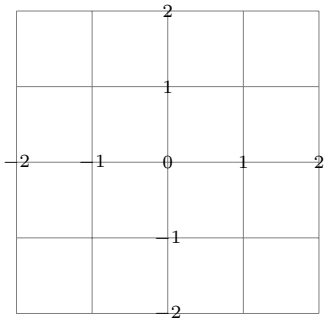
Grid from (0,0) til (10,5)

Grid
The coordinate system is infinite. The picture only shows the relevant segment of the coordinate system.



Grid from (-10,5) til (0,0)

Grid
The coordinates are usually used without units. The default distance between two integers is 1cm. But you can also use units, thereby scaling the entire picture.



Grid from (-2,-2) til (2,2)

Note that the grid is unvisible unless you make it visible by special commands. See the example code below.

7.1 Nodes

General Points
A node is defined by its position. You can decide whether

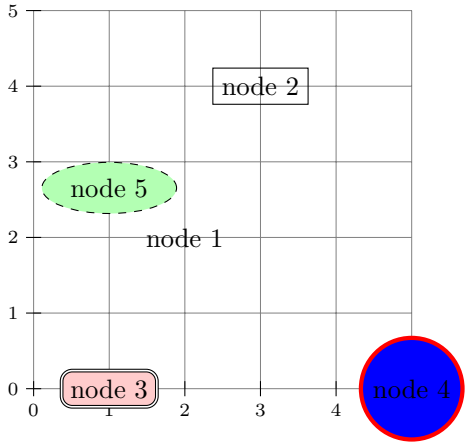
- there should be text at this position (The node position is the center of the text)

- the node should have a visible form and color

Scheme

```
\begin{tikzpicture}
\node[options] (node label) at (x-position,y-position) {text};
\end{tikzpicture}
```

Examples



Examples

```
\begin{tikzpicture}
%Grid
\draw[style=help lines,gray] (0,0) grid (5,5);
\foreach \x in {0,1,2,3,4,5}
\draw (\x,-.1) -- (\x,.1) node[below=5pt] {$\scriptstyle\x$};
\foreach \y in {0,1,2,3,4,5}
\draw (-.1,\y) -- (.1,\y) node[left=5pt] {$\scriptstyle\y$};
%node
\node (1) at (2,2) {node 1};
\node[draw] (2) at (3,4) {node 2};
\node[fill=red!20,draw,double,rounded corners] (3) at (1,0) {node 3};
\node[circle,fill=blue,draw=red,ultra thick] (4) at (5,0) {node 4};
\node[below,ellipse,draw,dashed,fill=green!30] (5) at (1,3) {node 5};
\end{tikzpicture}
```

The most important options for nodes

- `draw=`*color*: draws a line around the node in the given form, default is a rectangle, color can be changed by an optional specification (default is black)
- `fill=`*color*: fills the node with a color, default is black *Tip:* using `!number`, you can optionally change the opacity, the number is a percentage
- `double`: doubles the line around the node
- `rounded corners`: rounds corners for rectangles
- `circle`, `ellipse`, `diamond`, `star`: changes the form of the node (`ellipse` requires the package `pgflibraryshapes`)
- `ultra thin`, `very thin`, `thin`,

- `semithick`, `thick`, `very thick`, `ultra thick`: the width of the line
- `dashed`, `dotted`, `dashdotted`: changes the style of the line (dashed or dotted)
- `above left`, `above`, `above right`, `right`, `below right`, `below`, `below left`, `left`: determines the position of the text, default is center

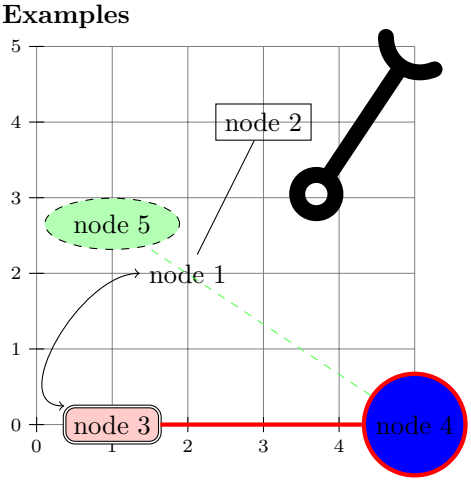
7.2 Connections

General Points
In general, you define nodes to connect them with lines. Using the node labels, you can refer to defined nodes or you can refer to nodes by position.

Scheme

```
\draw [options] (node1) to (node2);
\draw [options] (xPosition1,yPosition1) to (xPosition2,yPosition2);
```

Examples



Examples

```
\begin{tikzpicture}
%grid
\draw[style=help lines,gray] (0,0) grid (5,5);
\foreach \x in {0,1,2,3,4,5}
\draw (\x,-.1) -- (\x,.1) node[below=5pt] {$\scriptstyle\x$};
\foreach \y in {0,1,2,3,4,5}
\draw (-.1,\y) -- (.1,\y) node[left=5pt] {$\scriptstyle\y$};
%nodes
\node (1) at (2,2) {node 1};
\node[draw] (2) at (3,4) {node 2};
\node[fill=red!20,draw,double,rounded corners] (3) at (1,0) {node 3};
\node[circle,fill=blue,draw=red,ultra thick] (4) at (5,0) {node 4};
\node[below,ellipse,draw,dashed,fill=green!30] (5) at (1,3) {node 5};
%connections
\draw (1) to (2);
\draw [<->] (1.west) to [out=180,in=180] (3.north west);
\draw [ultra thick,red] (3) to (4);
\draw [dashed,green!70] (4) to (5);
\draw [)-o,line width=6pt] (5,5) to (3.5,2.75);
\end{tikzpicture}
```

Important options

- *start arrow kind-end arrow kind*: determines the look of the ends of the lines; the most important are: `<, >, |, (, ), [, ], *, o, diamond, open diamond, square, open square` (for this extend the preamble by `\usepgflibrary{arrows}`)
- `ultra thin`,...,`ultra thick`, `line width`=Width: Defines the width of the line
- *color*: changes the color of the line
- `dashed`, `dotted`, `dashdotted`, : type of the line
- `(Label.north west)`, `(Label.north)`, `(Label.north east)`, `(Label.east)`, `(Label.south east)`, `(Label.south)`, `(Label.south west)`, `(Label.west)`: starting point for the connection; follows the node label; default is the point that leads to the shortest connection

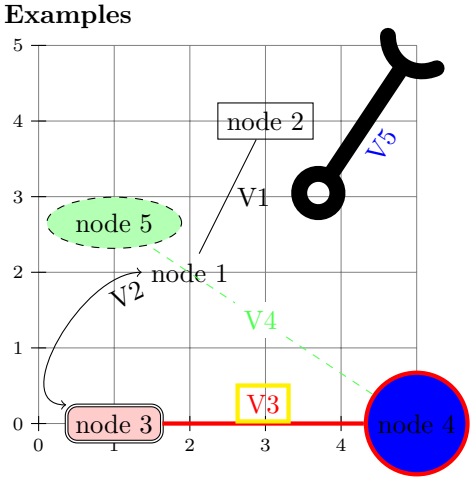
7.3 Labels

General Points
Sometimes, the connection between two nodes has to be given a name.

Scheme

```
\draw [options] (node1) to node[options] {label} (node2);
\draw [options] (xPosition1,yPosition1) to node[options] {label} (xPosition2,yPosition
    2);
```

Examples



Examples

```
\begin{tikzpicture}
%grid
\draw[style=help lines,gray] (0,0) grid (5,5);
\foreach \x in {0,1,2,3,4,5}
\draw (\x,-.1) -- (\x,.1) node[below=5pt] {$\scriptstyle\x$};
\foreach \y in {0,1,2,3,4,5}
\draw (-.1,\y) -- (.1,\y) node[left=5pt] {$\scriptstyle\y$};
%nodes
\node (1) at (2,2) {node 1};
\node[draw] (2) at (3,4) {node 2};
\node[fill=red!20,draw,double,rounded corners] (3) at (1,0) {node 3};
\node[circle,fill=blue,draw=red,ultra thick] (4) at (5,0) {node 4};
\node[below,ellipse,draw,dashed,fill=green!30] (5) at (1,3) {node 5};
```

```
%connections and labels
\draw (1) to node[right] {V1} (2);
\draw [<->] (1.west) to [out=180,in=180] node[below,sloped,very near start] {V2} (3.
    north west);
\draw [ultra thick,red] (3) to node[above,draw=yellow] {V3} (4);
\draw [dashed,green!70] (4) to node[fill=white] {V4} (5);
\draw [)-o,line width=6pt] (5,5) to node[below,sloped] {\textcolor{blue}{V5}}
    (3.5,2.75);
\end{tikzpicture}
```

Important options

- all the options for nodes
- `sloped`: the label follows the run of the line
- `very near start`, `near start`, `near end`, `very near end`: shifts the position of the label from the center to one of the ends of the line
- the color of the label is the same as the line color, it can be changed by `\textcolor{color}{label}`.

Chapter 8

Tree Structures in LaTeX with tikz-qtree

8.1 Introduction

Why trees?
Trees are special kinds of graphs and are used in linguistics to:

- represent morphosyntactic structures and processes
- depict hierarchical structures (e.g. feature geometries)

Implementation
There are several packages in LaTeX for drawing trees:

- `ps-trees`: not pdfLaTeX-ready, relatively complicated syntax, position and look of the nodes are easy to change (the result however is very asymmetrical), nodes can easily connected by arrows
- `qtree`: pdfLaTeX-ready, simple syntax, adjustments are difficult, no arrows possible
- `xytree`: pdfLaTeX-ready, relatively complicated syntax (similar to ps-trees), position and look of the nodes are easy to change
- `tikz-qtree`: pdfLaTeX-ready, simple syntax, adjustments and node connections (arrows) as in tikz

documentation for `tikz-qtree`**:** `ftp://ftp.tu-chemnitz.de/pub/tex/graphics/pgf/contrib/tikz-qtree/tikz-qtree-manual.pdf`

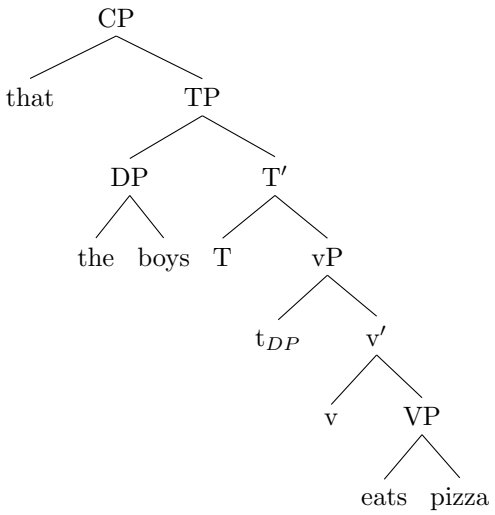
Scheme

```
\usepackage{tikz} %for all basic options
\usepackage{tikz-qtree} %for simple tree syntax
\usepackage{pgflibraryshapes}%for special forms
\usepgflibrary{arrows} %for arrow endings
\usetikzlibrary{positioning,shapes.multipart} %for structured nodes
\usetikzlibrary{tikzmark}
...
\begin{document}
...
\ex. %trees should always be in a numbered environment, e.g. \ex.- or figure-
    environment
        \begin{tikzpicture}[baseline=0pt,options] %baseline=0pt aligns the figure with
            the example number
        \tikzset{options} %options can be set with \tikzset or as optional argument to
            \begin{tikzpicture}
        \Tree [...Code...] %bracket structure for trees
        \draw ... %node connections
        \end{tikzpicture}
```

```
\end{document}
```

Basics: A simple tree
Quite often, you only want to display a structure in a tree without depicting processes with arrows.

(1)



Note: The syntax is completely identical to the syntax of the package `qtree`.

Basics: A simple tree

```
\ex. \begin{tikzpicture}[baseline=0pt]
       \Tree [.CP that [.TP [.DP the boys ] [.T$'$ T [.vP t$_{DP}$ [.v$'$ v [.VP eats
           pizza ]]]]]]
\end{tikzpicture}
```

Important!:

- A dot "." must appear before every label of a non-terminal node
- There must be a space before and after every node (can be deleted between closing brackets); more than one word can appear in one node if they are in curly brackets
- Every opening bracket must be closed

Changing the distances: `qtree`
In the package qtree, the distances between nodes can be changed by:

```
\Tree [.X A B ] \Tree [.X A !\qsetw{2cm} B ]
```

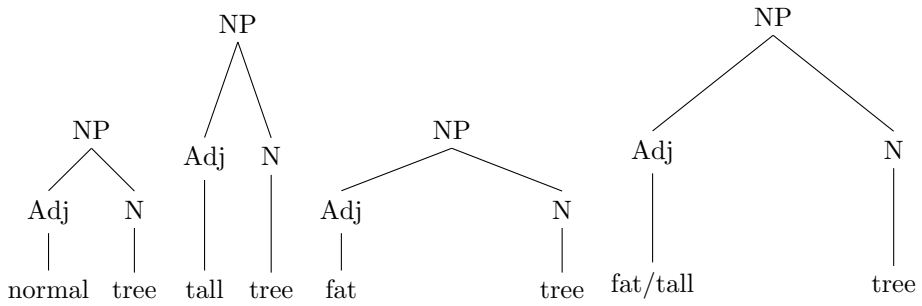
This option is not compatible with tikz-qtree.

Changing distances: `tikz-qtree`
In `tikz-qtree`, the ideal distance between nodes is calculated (that is why the tree is slightly asymmetrical). You can also change the height and width of the entire tree.

```
\begin{tikzpicture}
\Tree [.NP [.Adj normal ] [.N tree ] ]
\end{tikzpicture}
%
\begin{tikzpicture}
\tikzset{level distance=50pt}
\Tree [.NP [.Adj tall ] [.N tree ] ]
\end{tikzpicture}
```

```
%
\begin{tikzpicture}[sibling distance=60pt]
\Tree [.NP [.Adj fat ] [.N tree ] ]
\end{tikzpicture}
%
\begin{tikzpicture}
\tikzset{level distance=50pt,sibling distance=60pt}
\Tree [.NP [.Adj fat/tall ] [.N tree ] ]
\end{tikzpicture}
```

Changing distances: `tikz-qtree`



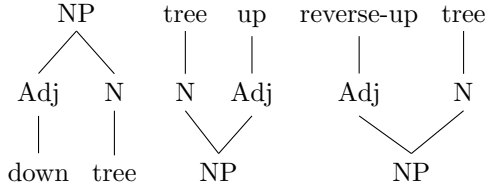
Direction of the trees
Two options with four values each:

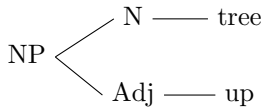
- 1. option `[grow]`: the nodes are placed counter-clockwise in relation to the mother node
- 2. option `[grow']`: the nodes are placed clockwise in relation to the mother node
- values: `left`, `right`, `down`, `up` (`down` is default)

```
\begin{tikzpicture}
\Tree [.NP [.Adj down ] [.N tree ] ]
\end{tikzpicture}
%
\begin{tikzpicture}[grow=up]
\Tree [.NP [.Adj up ] [.N tree ] ]
\end{tikzpicture}
%
\begin{tikzpicture}[grow'=up]
\Tree [.NP [.Adj reverse-up ] [.N tree ] ]
\end{tikzpicture}

\begin{tikzpicture}[grow=right]
\tikzset{level distance=40pt,sibling distance=10pt}
\tikzset{execute at begin node=\strut} %gleicht die Größe der Knoten an
\Tree [.NP [.Adj up ] [.N tree ] ]
\end{tikzpicture}
```

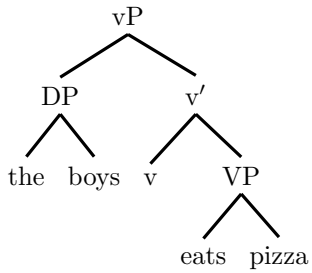
Direction of the trees: Examples





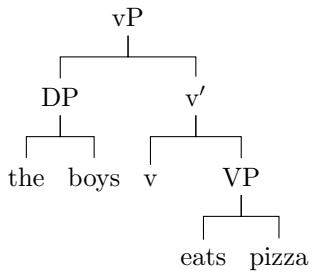
Edge style: width

```
\begin{tikzpicture}[baseline=0pt]
\tikzset{edge from parent/.append style={very thick}} %ultra thick, ..., ultra thin
\Tree [.vP [.DP the boys ] [.v$'$ v [.VP eats pizza ]]]
\end{tikzpicture}
```



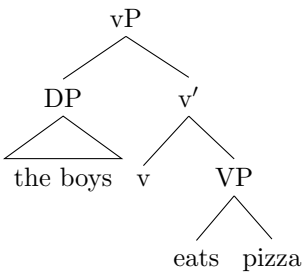
Edge style: form

```
\begin{tikzpicture}[baseline=0pt]
\tikzset{edge from parent/.style=
{draw,
edge from parent path={(\tikzparentnode.south)
-- +(0,-8pt)
-| (\tikzchildnode)}}}
\Tree [.vP [.DP the boys ] [.v$'$ v [.VP eats pizza ]]]
\end{tikzpicture}
```



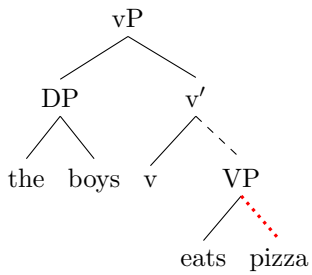
Edge style: roofs

```
\begin{tikzpicture}[baseline=0pt]
\Tree [.vP [.DP \edge[roof]; {the boys} ] [.v$'$ v [.VP eats pizza ]]]
\end{tikzpicture}
```



Edge style: line style

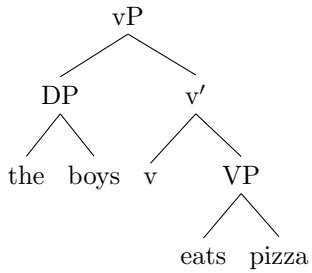
```
\begin{tikzpicture}[baseline=0pt]
\Tree [.vP [.DP the boys ] [.v$'$ v \edge[dashed]; [.VP eats \edge[dotted,very thick,
    red]; pizza ]]]
\end{tikzpicture}
```



Placement of nodes

You can turn every node in the tree to a real node for TikZ, using the command `\node`:
`\node [options] (label){content};`

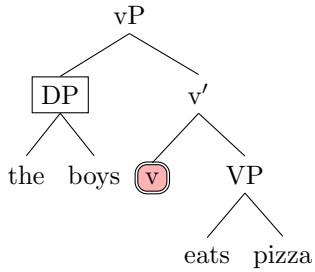
```
\begin{tikzpicture}[baseline=0pt]
\Tree [.vP [.\node{DP}; the boys ] [.v$'$ \node{v}; [.VP eats pizza ]]]
\end{tikzpicture}
```



Options for nodes

The look of nodes is changed by the standard TikZ-options.

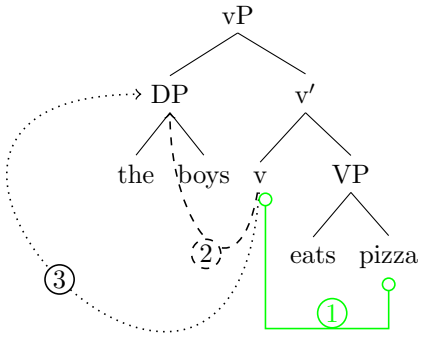
```
\begin{tikzpicture}[baseline=0pt]
\Tree [.vP [.\node[draw]{DP}; the boys ] [.v$'$ \node[fill=red!30,draw=black,double,
    rounded corners]{v}; [.VP eats pizza ]]]
\end{tikzpicture}
```



Connections between nodes

```
\begin{tikzpicture}[baseline=0pt]
\Tree [.vP [.\node(DP){DP}; the boys ] [.v$'$ \node(v){v}; [.VP eats \node(obj){pizza
    }; ]]]
%draws an angled line between two nodes
\draw[semithick,green,o-o] ([xshift=2em]v) |- +(0.25,-2) node[above,circle,draw,fill=
    white,inner sep=1pt]{1} -| (obj);
```

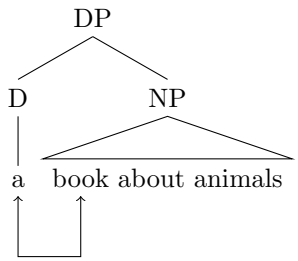
```
%draws a curved line between two nodes
\draw[semithick,dashed,->] ([xshift=-2em]v) to [out=-100,in=-90, looseness=2.5] node[
    below,circle,draw,fill=white,inner sep=1pt] {2}(DP);
%draws a curved line between two nodes
\draw[semithick,dotted,->] ([xshift=-1em]v)..controls +(south:5) and +(west:5)..node[
    circle,draw,solid,fill=white,inner sep=1pt] {3} (DP);
\end{tikzpicture}
```



8.2 More Nodes

Embedding nodes

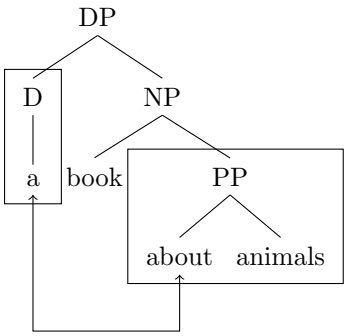
```
\begin{tikzpicture}[baseline=0pt, remember picture] %remember picture is important
\Tree [.DP [.D \node(D){a}; ] [.{NP} \edge[roof];
       \node {\subnode{N}{book} about animals}; ]] %\subnode defines a node within a
           node, requires \usetikzlibrary{tikzmark}
\draw[<->] (D) |- +(0,-1) -| (N);
\end{tikzpicture}
```



8.3 Highlighting parts of the tree

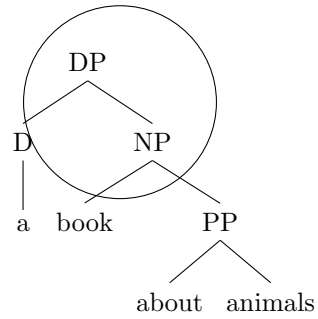
Framing parts of a tree I

```
\begin{tikzpicture}[baseline=0pt, remember picture]
\Tree [.DP [.\node(D){D}; \node(a){a}; ] [.NP book [.\node(PP){PP}; \node(P){about}; \
    node(an){animals}; ] ] ]
\node[draw,fit=(D)(a)]{}; %fit inserts multiple nodes into one, requires \
    usetikzlibrary{fit}
\node[draw,fit=(PP)(P)(an)]{};
\draw[<->] (a) |- +(0,-2) -| (P);
\end{tikzpicture}
```

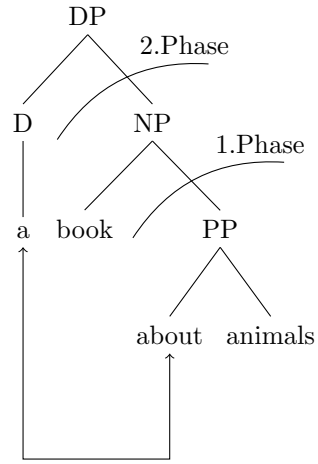


Framing parts of a tree II

```
\begin{tikzpicture}[baseline=0pt, remember picture]
\Tree [.\node(DP){DP}; [.\node(D){D}; \node(a){a}; ] [.\node(NP){NP}; book [.\node(PP)
    {PP}; \node(P){about}; \node(an){animals}; ] ] ]
\node[draw,circle,fit=(DP)(NP)]{};
\end{tikzpicture}
```



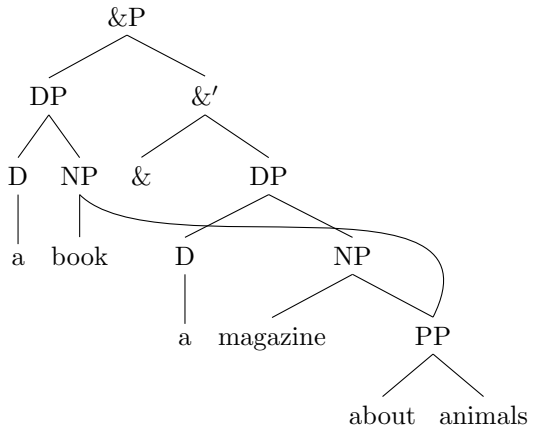
Highlighting phases




```
\begin{tikzpicture}[baseline=0pt, remember picture,level distance=40pt]
\Tree [.DP [.\node(D){D}; \node(a){a}; ] [.NP book [.\node(PP){PP}; \node(P){about}; \
    node(an){animals}; ] ] ]
\draw[<->] (a) |- +(0,-3) -| (P);
\begin{scope}[shift={(-2em,-4.3em)}] %allows an overlap of lines and the tree
\draw (0.3,0) edge[bend left] node[above,very near end]{2.Phase} (2.3,1.0);
\draw (1.3,-1.3) edge[bend left] node[above,very near end]{1.Phase} (3.3,-0.3);
\end{scope}
\end{tikzpicture}
```

8.4 Multidominance

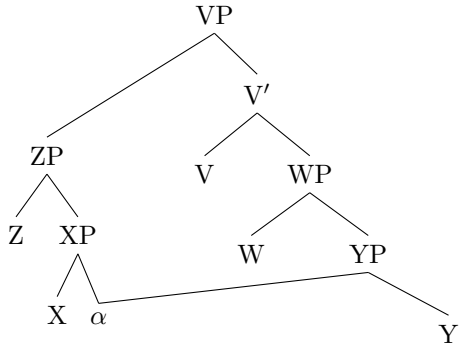
Multidominance structures I



Multidominance structures I

```
\begin{tikzpicture}[baseline=0pt, remember picture]
\Tree [.\&P [.DP [.\node(D){D}; \node(a){a}; ] [.\node(NP){NP}; book ] ] [.\&{$'$} \&
    [.DP [.\node(D){D}; \node(a){a}; ] [.NP magazine \edge[bend left]; [.\node(PP){PP
    }; \node(P){about}; \node(an){animals}; ] ] ]]]
\draw (NP.south)..controls +(1,-1) and +(1,2) ..(PP.north);
\end{tikzpicture}
```

Multidominance structures II



Multidominance structures II

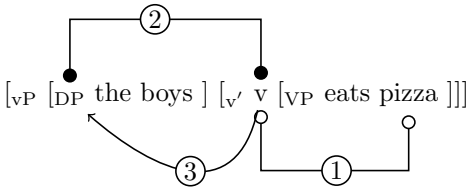
```
\begin{tikzpicture}[baseline=0pt, remember picture]
\tikzset{level 4/.style={sibling distance=5em}}
\Tree [.\node(ZP){ZP}; Z [.{XP} \node[shift={(-7em,0em)}]{X}; \node[shift={(7em,0em)
    }](a){$\alpha$}; ]]
%
\begin{scope}[shift={(6.3em,5.3em)}]
\Tree [.\node(VP){VP}; \edge[draw=none]; {} [.V$'$ V [.WP W [.\node(YP){YP}; \edge[
    draw=none]; {} Y ]]]] %one node is empty, the connection is invisible
\end{scope}
\draw (YP.south) to (a.north); %node connection
\draw (VP.south) to (ZP.north);
\end{tikzpicture}
```

8.5 Bracket Structures

Bracket structures

```
\ex. \begin{tikzpicture}[baseline=0pt,remember picture]
%the entire structure must be a node
%the command \subnode requires \usetikzlibrary{tikzmark}
\node {[\sub{vP} [\subnode{DP}{\sub{DP}} the boys ] [\sub{v$'$} \subnode{v}{v} [\sub{
    VP} eats \subnode{obj}{pizza} ]]]}; %\sub is for subscript text, requires \
    newcommand{\sub}[1]{\textsubscript{#1}} in the preamble
\draw[semithick,o-o] (v) |- +(1,-1) node[circle,draw,solid,fill=white,inner sep=1pt]
    {1} -| node{}(obj);
\draw[semithick,->] (v)..controls (south:1.5) and (south west:1.5) ..node[circle,draw,
    solid,fill=white,inner sep=1pt] {3} (DP);
\draw[semithick,*-*] (v) |- +(-1.4,1) node[circle,draw,solid,fill=white,inner sep=1pt]
     {2} -| (DP);
\end{tikzpicture}
```

(2)



Chapter 9

Attribute Value Matrices (HPSG) in LaTeX

Attribute Value Matrices with avm

Attribute Value Matrices, as used e.g. in HPSG, are easily depicted with the package `avm`.

```
...
\usepackage{avm}
...
\begin{document}
...
\begin{avm}
...
\end{avm}
...
\end{document}
```

http://nlp.stanford.edu/manning/tex/avm-doc.pdf http://www.essex.ac.uk/linguistics/external/clmt/latex4ling/avms/

Example

(1)
$$\left[\begin{array}{ll} \text{cat} \mid \text{subcat} & \left\langle \text{NP}_{it},\ \text{NP}_{\boxed{2}},\ \text{S[comp]}{:}\boxed{3} \right\rangle \\ \text{content} & \left\{ \left[\begin{array}{ll} \text{relation} & \textbf{bother} \\ \text{bothered} & \boxed{2} \\ \text{soa-arg} & \boxed{3} \end{array}\right] \right\} \end{array}\right]$$

```
\begin{avm}
\[ cat \| subcat & \< NP$_{it}$, NP$_{\@2}$, S[comp]:\@3\>\\
   content & \{\[ relation & \bf bother\\
                bothered & \@2 \\
                soa-arg & \@3
              \]\} \]
\end{avm}
```

Options

(2)

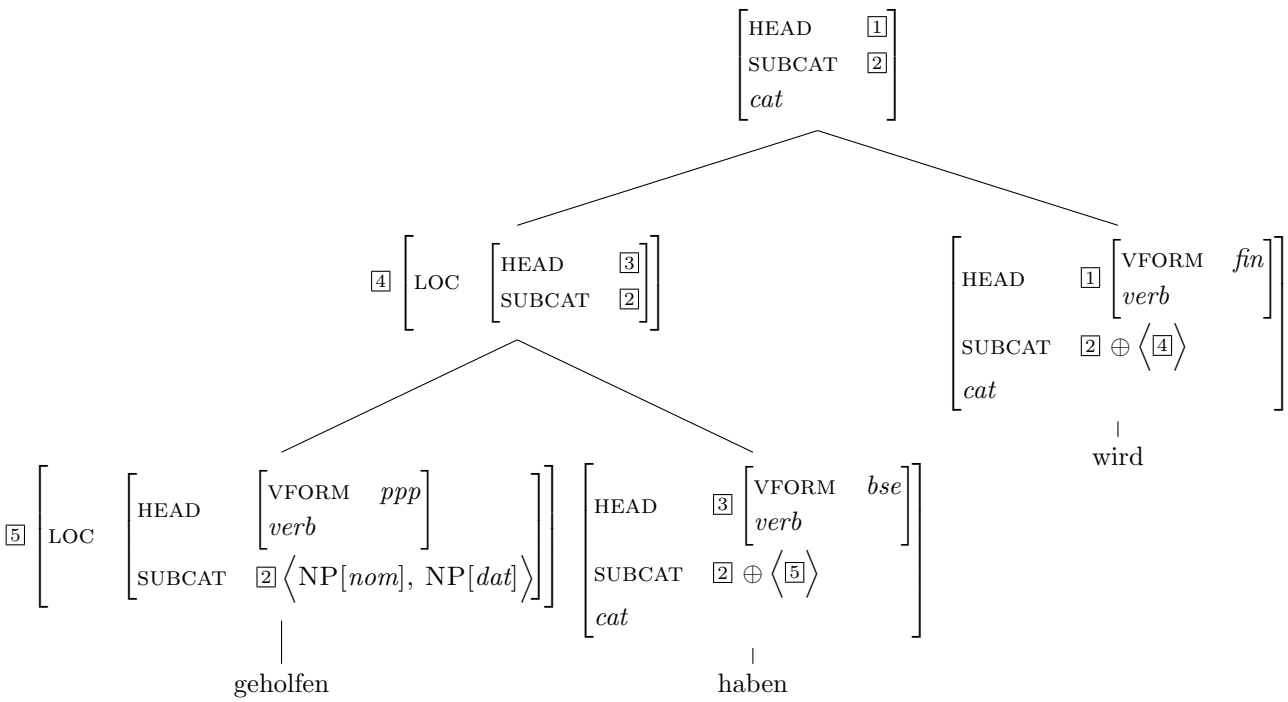
headed phrase
$$\begin{bmatrix} \text{CAT} \mid \text{SUBCAT} & \left\langle \text{NP}_{it},\ \text{NP}_{\boxed{2}},\ \text{S}\left[\text{COMP}\right]:\boxed{3} \right\rangle \\ \text{CONTENT} & \left\{ \begin{bmatrix} \text{RELATION} & \textbf{bother} \\ \text{BOTHERED} & \boxed{2} \\ \text{SOA-ARG} & \boxed{3} \end{bmatrix} \right\} \end{bmatrix}$$

```
\avmfont{\sc}
\avmoptions{topleft,sorted} %sorted allows for labels, topleft|topright|bottomleft|
    bottomright provides the position of the label
\avmvalfont{\rm}
\avmsortfont{\scriptsize\it}

\ex. \begin{avm}
\[{headed phrase} cat \| subcat & \< NP$_{it}$, NP$_{\@2}$, S\[{} comp \]:\@3\>\\
   content & \{\[{} relation & \bf bother\\
               bothered & \@2 \\
               soa-arg & \@3
            \]\} \]
\end{avm}
```

AVMs in trees

(3)



?, 243

AVMs in trees

```
\ex. \begin{tikzpicture}[baseline=0pt,level distance=3cm]
\Tree [.{\begin{avm}
\[ head & \@1 \\
   subcat & \@2 \\
   {\it cat} & \]
\end{avm}} [.{\begin{avm}
\@4 \[ loc & \[ head & \@3 \\<all>
```

```
              subcat & \@ 2 \]\]
\end{avm}} [.{\begin{avm}
\@5 \[ loc & \[ head & \[ vform & {\it ppp} \\<all>
                        {\it verb} \] \\<all>
              subcat & \@2 \< NP[{\it nom}], NP[{\it dat}]\> \] \]
\end{avm}} geholfen ] [.{\begin{avm}
\[ head & \@3 \[ vform & {\it bse} \\<all>
                {\it verb} \] \\<all>
   subcat & \@2 $\oplus$ \< \@5 \> \\<all>
   {\it cat} \]
\end{avm}} haben ]] [.{\begin{avm}
\[ head & \@1 \[ vform & {\it fin} \\
                {\it verb} \] \\
   subcat & \@2 $\oplus$ \< \@4 \> \\
   {\it cat} \]
\end{avm}} wird ]]
\end{tikzpicture}
```

avm and beamerarticle

If you use `beamerarticle`, the command `\\` for linebreaks is ignored (Exception: table environments).

Since the command is also ignored in `avm` environments, you have to replace `\\` with `\cr` .

```
\ex. \begin{avm}
\[ cat \| subcat & \< NP$_{it}$, NP$_{\@2}$, S[comp]:\@3\>\cr
   content & \{\[ relation & \bf bother\cr
              bothered & \@2 \cr
              soa-arg & \@3
            \]\}
\]
\end{avm}
```