Introduction to LaTeX

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Contents

What is LaTeX?

- Typesetting system
- ***Not** a word processor!*
- Focus on *content* instead of *appearance*
- https://www.latex-project.org/about/

What do you need to get?

1. The LaTeX *distribution*
   - Allows you to *compile* your document
     - Output formats: PDF, DVI & PostScript
     - That's right, it's like programming!
2. The LaTeX *editor*
   - Simplifies editing of your document

- Or use an online editor
  - ShareLaTeX (Google Docs for LaTeX)

Where do you get it?

- Many options. One example for each OS:
  - Distributions
    - Windows: MiKTeX (includes TeXworks editor)
    - Linux: TeX Live (includes TeXworks editor)
    - Mac: MacTeX (also an editor)
  - Editor
    - All major: TeXStudio
- https://www.latex-project.org/get/

How to get started?

- “Focus on *content* instead of *appearance*”
- *Some* code is needed to start writing content:

```
\documentclass{article}
\begin{document}
    Hello world!
\end{document}
```

What does it mean?

- LaTeX is controlled by *commands* (or *macros*) which start with backslash \
  - `\documentclass`
  - `\begin`
  - `\end`
- **Case Sensitive!**

```
\documentclass{article}
\begin{document}
    Hello world!
\end{document}
```

What does it mean?

- Some commands use *arguments*
  - Enclosed within brackets `{ }` which follow the command
  - `\document` has the argument *`article`*
  - `\begin` and `\end` have the argument *`document`*

```
\documentclass{article}
\begin{document}
    Hello world!
\end{document}
```

What does it mean?

- Set document class
  `\documentclass[`*`options`*`]{`*`class`*`}`
  - What type of document; different typesetting
  - Options is optional -> it can be omitted
  - `article`, `book`, `report`, `letter`, `beamer` (slides)
- Options and classes

```
\documentclass{article}
\begin{document}
    Hello world!
\end{document}
```

What does it mean?

- `\begin{document}` and `\end{document}` define the *Document content*
  - All text must be placed here!
  - Content following `\end{document}` is ignored!

```
\documentclass{article}
\begin{document}
    Hello world!
\end{document}
```

Parts of a LaTeX document

- Always starts with `\document{`*`class`*`}`
- Then the *preamble*
  - Load packages (e.g. language)
  - Layout changes
- \begin{document}
- Document content
- \end{document}

Preamble – Load Packages

- A package is loaded with the command `\usepackage[`*`options`*`]{`*`packageName`*`}`
  - The brackets with options may be omitted
  - The one you'll use the most is graphicx `\usepackage{graphicx}`
- Multiple packages can be included in the same command `\usepackage{`*`package1, package2`*`}`

Preamble – Language

- Language settings
  - For letters å, ä and ö
    `\usepackage[utf8]{inputenc}`
  - Swedish word-division and translation of standard headings (e.g. Abstract)
    `\usepackage[swedish]{babel}`

Document content

- LaTeX ignores
  - Multiple spaces and single new line
    - They are considered a single space
    - Double new line starts a new paragraph
      - To force a new line, use \\
  - Space after commands
    - To insert a hard space, use backslash space: \␣
  - Tabs
    - Can be used to increase code readability

Document content

- Special characters
  - Have a special meaning to LaTeX
  - Must be *escaped* (i.e. preceded by backslash) to be written in text

Character	Meaning to LaTeX	Text command
\	Starts a command, escape characters	`\textbackslash`
{ }	Starts/ends argument or group	`\{` or `\}`
%	Comment the rest of the line	`\%`
~	Insert non-breaking space	`\textasciitilde`
$	Starts maths expression	`\$`
&	Column separator (in tables)	`\&`

Grouping text together

- Scope
  - Begins with a left bracket {
  - Ends with a right bracket }
  - Apply typesetting to certain text
    - Group the text and command together
- Group arguments to commands
  - `\usepackage{package1, package2}`

Formatting – decoration

- Commands take the text to decorate as an argument: `\command{text}`

Formatting	Example	Command
Bold	**Text**	`\textbf{Text}`
Italic	*Text*	`\textit{Text}`
Underline	Text	`\underline{Text}`
Typewriter (or code)	`Text`	`\texttt{Text}`
Small Capitals	TEXT	`\textsc{Text}`

- More information

Formatting – size

- Size is relative to the document class' normal size
- Use scope, { }, to limit to certain text
- tiny, scriptsize, footnotesize, small
- normalsize
- large, Large, LARGE, huge, Huge
- More information and examples

Inserting images

- Not in vanilla LaTeX – we need a package
  - `\usepackage{graphicx}`
- `\includegraphics{“`*`pathToImage`*`"}`
  - Do not include extension
  - If path to image includes no spaces, the quotes may be omitted.

Headers

- `\section{`*`title`*`}` or `\section*{`*`title`*`}`
  - Top level header
  - * means it's not numbered nor in table of contents
- `\subsection` or `\subsection*`
- `\subsubsection` or `\subsubsection*`
- More information

Environments

- More complex groups
- An environment is declared with:

```
\begin{EnvironmentName}
    Environment content…
\end{EnvironmentName}
```

- That's right, you've already seen an environment – *document*!
- For readability indent contents of an environment

Center environment

- Center all text in the environment

```
Regular content…
\begin{center}
    Centered content\ldots
\end{center}
```

List environments

- Three different
  - enumerate

```
\begin{enumerate}
    \item First
    \item Second
    \item Third
\end{enumerate}
```

1. First
2. Second
3. Third

  - itemize

```
\begin{itemize}
    \item First
    \item Second
    \item Third
\end{itemize}
```

- First
- Second
- Third

  - description

```
\begin{description}
    \item[Label 1] First
    \item[Label 2] Second
    \item[Label 3] Third
\end{description}
```

Label 1 First

Label 2 Second

Label 3 Third

List environments

- Can be nested: Maximum 4 levels
  - More will generate an error message and then be ignored
- Can be mixed

```
\begin{enumerate}
    \item First
    \item Second
    \begin{itemize}
        \item Bulleted Sub-item
        \begin{description}
            \item[Label] Item
        \end{description}
    \end{itemize}
    \item Third
\end{enumerate}
```

1. First
2. Second
   - Bulleted Sub-item

     Label Item
3. Third

Floating environments

- Environment for content that should fit in one page
  - Images
  - Tables
- LaTeX decides the best placement
  - Can be changed with *placement specifiers*

Floating environments

- Images use the floating environment `figure`, like so: `\begin{figure}`
- Tables use the environment `tabular`, like so: `\begin{tabular}`
- Placement specifiers are added to the end in brackets, like so:
  `\begin{figure}[p]`
  `\begin{tabular}[!t]`

Placement specifiers

Placement Specifier	Effect
`h`	Place the float *approximately* **here**.
`t`	Place the float at the **top** of the page (usually current or next depending on number of floats).
`b`	Place the float at the **bottom** of the page (usually current or next depending on number of floats).
`p`	Place the float on a **separate page** only for floats.
`H`	Place the float **precisely here**, i.e. at the location it occurs at in the LaTeX code.
`!`	**Enforce** the placement specifier. Without this, LaTeX uses the specifier as a suggestion. *Note: Place the exclamation mark before the other specifiers.*

Floating environments

- Commands included in the environment are applied until the environment ends
  - `\caption{`*`captionText`*`}`
  - `\centering`
- More information

Tabular environment

- Create tables
- `\begin{tabular}[`*`pos`*`]{`*`table spec`*`}`
- *pos* is the position
  - `b`, `c` or `t` for bottom, center or top, respectively
- *table spec* defines the number of columns and vertical lines

Tabular environment

Spec	Description
`l`	Adds a column, left justified.
`c`	Adds a column, centered.
`r`	Adds a column, right justified.
`p{`*`width`*`}`	Adds a column of a certain *width* with the text aligned to the top left. Overflowing text will wrap.
`|`	Add a single vertical line
`||`	Add a double vertical line

- More information

Table contents

- & separates column contents
- `\\` denotes new row
- `\hline` adds a horizontal line
- `\cline{`*i*`-`*j*`}` adds a line spanning column *i* to column *j*
  - The first column is 1
- `\newline` adds a new line within a cell

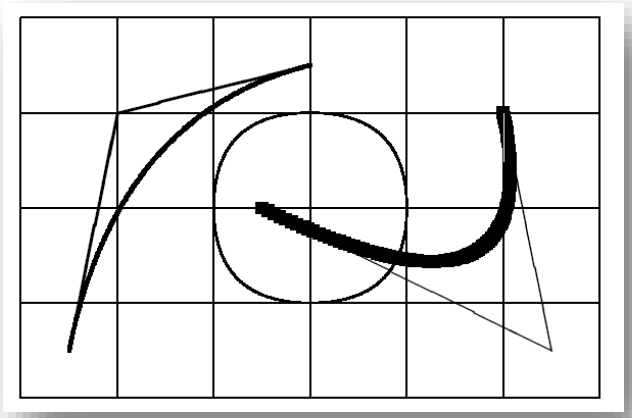
Table contents

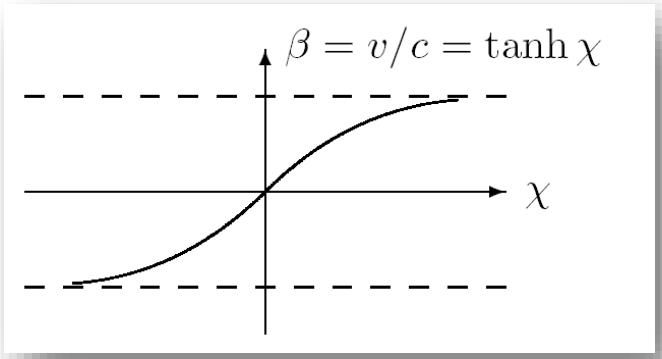
```
\begin{tabular}{l r | c || p{3cm}}
    \hline
    This & is & a & table with some nice content \\ \cline{4-4}
    In & a & paragraph &
    cell, a lot of content can be shown.
    \newline\newline Newlines also work. \\ \hline
\end{tabular}
```

This	is	a	table with some nice content
In	a	paragraph	cell, a lot of content can be shown. Newlines also work.

Picture environment

- Allows you to “program” your own pictures
  - Only basic functionality
- More information





Environment summary

Environment Name	Description
`document`	Defines the content area for the document.
`center`	Center the text in the environment.
`enumerate`	Numbered list, each list item on its own row starting with `\item`. LaTeX handles up to 4 levels.
`itemize`	Bulleted list, each list item on its own row starting with `\item`. LaTeX handles up to 4 levels.
`description`	Labelled list, each list item on its own row starting with `\item[`*`LabelName`*`]`. LaTeX handles up to 4 levels.
`figure`	Environment for formatting images.
`picture`	Program your own picture (e.g. graphs).
`tabular`	Table declaration.

References

- Add a label directly after what you want, to reference: `\label{`*`labelName`*`}`
  - `\section`, `\item` , `\caption` ...
  - Numbering is automatically updated!
- Reference the numbering of a label with: `\ref{`*`labelName`*`}`
- Reference the page of a label with: `\pageref{`*`labelName`*`}`

Citations

- Create reference list using the `thebibliography` environment
  - `\begin{thebibliography}[`*`widestLabel`*`]`
  - The length of *`widestLabel`* determines the space used for the key

Referenser

[myLabel] Firstname Surname, *Book Title*, Publisher, City, Edition, Year.

[widestLabel] Some Author, *Great Title*, Publisher Inc., Karlskrona, 2nd Edition, 2016.

Citations

- Add a reference item using `\bibitem[`*`showLabel`*`]{`*`citeLabel`*`}`
  - *`showLabel`* sets the label in the references list
    - Rarely used
  - *`citeLabel`* is used when citing the reference

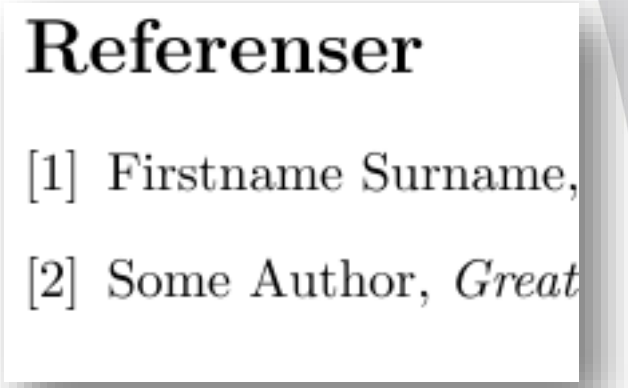
```
\bibitem{surnameXX}
    Firstname Surname, \emph{Book Title},
    Publisher, City, Edition, Year.
```

Referenser

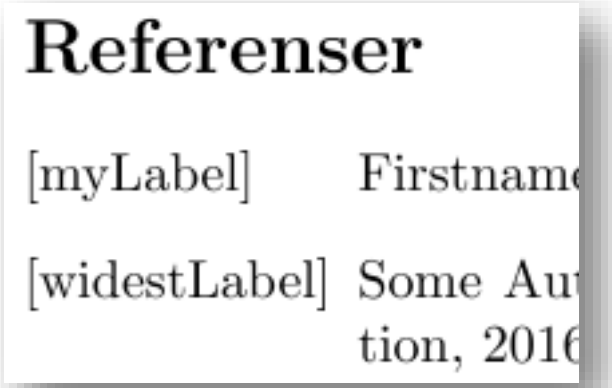
[1] Firstname Surname, *Book Title*, Publisher, City, Edition, Year.

Citations

```
\begin{thebibliography}{9}
    \bibitem{surnameXX} ...

    \bibitem{author16} ...
\end{thebibliography}
```



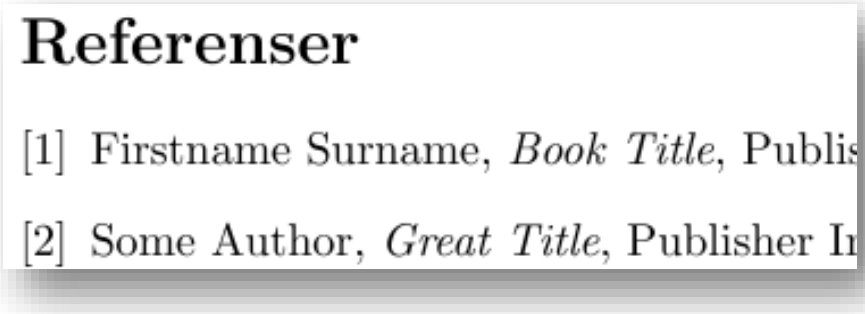

```
\begin{thebibliography}{widestLabel
}
    \bibitem[myLabel]{surnameXX}
    ...

    \bibitem[widestLabel]{author16}
    ...
\end{thebibliography}
```



Citations

- Cite a reference with the command `\cite{citeLabel}`

```
As noted in \cite{author16} the book is good.
```

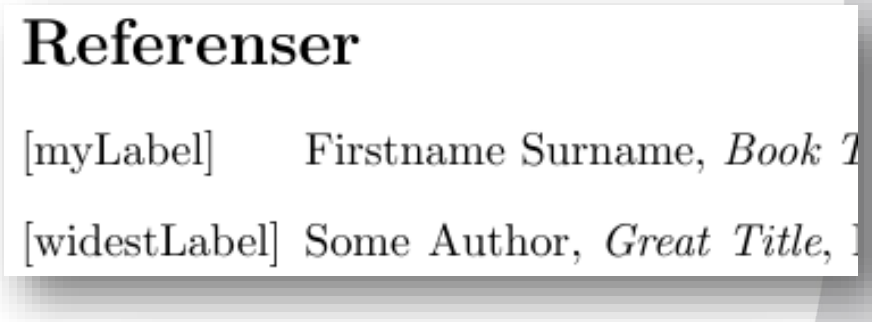


Referenser

[1] Firstname Surname, *Book Title*, Publis

[2] Some Author, *Great Title*, Publisher In

As noted in [2] the book is good.



Referenser

[myLabel] Firstname Surname, *Book T*

[widestLabel] Some Author, *Great Title*,

As noted in [widestLabel] the book is good.

Citations database

- Collect all your references in one place
- Separate file
  - Include the file, only cited references will be added to the reference list
- BibTeX
- More information

Maths

- $ starts a mathematical expression
  - End it with another $

```
Using $x$ and $y$ in an expression: $x = y$
```

Using x and y in an expression: $x = y$

- Mathematical environments
- More information

Questions?

Links

- Official site about LaTeX
- LaTeX tutorial document
- Wikibooks guide
- ShareLaTeX documentation