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Introduction to LaTeX

A first document

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- LaTeX file anatomy
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A minimal LaTeX document

```
\documentclass{article}
\begin{document}
Small, but \textbf{beautiful}.
\end{document}
```

Small, but beautiful.

File:firstdoc/minimal-document.tex

LaTeX file anatomy

.tex source file

preamble:
• global parameters
• packages in use

body:
• text + cross references
• math
• tables
• images
• bibliography

```
\documentclass{...}
\usepackage{...}
...

\begin{document}
```
preamble

```
\title{...}
\author{...}
\address{...}
\date{...}
```
top matter

```
\begin{abstract}
...
\end{abstract}
\maketitle
```
abstract

```
\section{...}

\section{...}
```
main matter

body

```
\begin{thebibliography}{9}
...
\end{thebibliography}
```
back matter

```
\end{document}
```

Ref. **Practical LaTeX** George Grätzer

LaTeX file anatomy

- A LaTeX file is composed of:
  - **preamble**
    It contains definitions and instructions that affect the entire document.
    - The first lines of a document are:
      \documentclass and \usepackage commands.
      - \documentclass tells LaTeX what kind of document to create
        tells LaTeX how the document is going to look (e.g. font size, margins)
      - \usepackage will load features to enable for the document.
  - **body**
    This is the content of the document environment. It contains all the material to be typeset.
    - is the actual text.
    - Enclosed by
      - \begin{document}
      - ….
      - \end{document}
- Everything after \end{document} is not processed:
  - Store comments
  - Temporary, to do text storage

LaTeX command

LaTeX commands start with a backslash ****

- the backslash character \ + sequence of letters
  - \command{*argument*}
    \begin{equation}
  - Command names are case sensitive
    \large   \Large \maketitle
- Characters with a special meaning: # $ & ~ _ ^ % { }
  - \ \textbackslash
  - \{   \}
  - \%
  - \$
  - \&

LaTeX command

- 2 kinds of markup commands
  - **Typographical** markup
    `\textbf{hello} world` = **hello** world
  - **Logical** markup
    `\title{Computational Physics}`
    `\section{Projectile motion}`
- 2 different formats of commands:
  - **Inline**
  - **Environment**

Inline command

- Structure of Inline Command
  `\command[optional]{mandatory}`
- Parameters are given in curly brackets `{ }`
- Optional parameters are supplied enclosed in square brackets `[]`
- Example
  - `\documentclass[12pt]{article}`
  - `\usepackage{package name}`
    - `\usepackage[dutch]{babel}`
  - `\emph{emphasized text}`

Environment command

- Environment commands tell LaTeX what to do with specific blocks of text. They always include `begin` and `end` commands.
- Example
  - `\begin{document}`   `\end{document}`
  - `\begin{itemize}`   `\end{itemize}`
  - `\begin{enumerate}`   `\end{enumerate}`
  - `\begin{center}`   `\end{center}`
  - `\begin{singlespace}`   `\end{singlespace}`
  - `\begin{quote}`   `\end{quote}`

Environment command

- A piece of information, limited by a clearly marked begin- and endpoint.
- Environments will apply a special formatting to the text within it
- Used for big chunks of material
- Examples:
  - the document itself
  - an abstract
  - lists
  - quotations
  - tables and figures
  - programming code
  - mathematical formula

```
\begin{abstract}
This is the place to
  put an abstract of
  your article, book,
  etc.
\end{abstract}
```

documentclass

- The first information LaTeX needs to know: type of document
  `\documentclass[options]{class}`
- Commonly used document classes {}
  - `book`: for real books
  - `report`: for longer reports containing several chapters, small books, etc.
  - `article`: articles in scientific journals, presentations, short reports, program documentation, invitations, etc.
  - `letter`: writing letters.
- Only one class can be used for each document.
  - http://tex.stackexchange.com/questions/782/what-are-the-available-documentclass-types-and-their-uses

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documentclass

- The first command in every LaTeX document tells what class is used.
  - Loads special functions and formatting appropriate to the type which appears in curly braces.
- Changes settings throughout the document such as:
  - Should there be a title page,
  - How to lay out the table of contents,
  - What sectioning commands are available,
  - Different margins, etc.
- A class is like a template which tells LaTeX what to do with the rest of the text that you input.

documentclass options []

`10pt, 11pt, 12pt`	Sets the size of the main font in the document. If no option is specified, 10pt is assumed.
`a4paper, letterpaper,...`	Defines the paper size. The default size is letterpaper; However, many European distributions of TeX now come pre-set for A4, not Letter, and this is also true of all distributions of pdfLaTeX. Besides that, a5paper, b5paper, executivepaper, and legalpaper can be specified.
`fleqn`	Typesets displayed formulas left-aligned instead of centered.
`leqno`	Places the numbering of formulas on the left hand side instead of the right.
`titlepage, notitlepage`	Specifies whether a new page should be started after the document title or not. The article class does not start a new page by default, while report and book do.
`twocolumn`	Instructs LaTeX to typeset the document in two columns instead of one.
`twoside, oneside`	Specifies whether double or single sided output should be generated. The classes article and report are single sided and the book class is double sided by default. Note that this option concerns the style of the document only. The option twoside does not tell the printer you use that it should actually make a two-sided printout.
`landscape`	Changes the layout of the document to print in landscape mode.
`openright, openany`	Makes chapters begin either only on right hand pages or on the next page available. This does not work with the article class, as it does not know about chapters. The report class by default starts chapters on the next page available and the book class starts them on right hand pages.
`draft`	makes LaTeX indicate hyphenation and justification problems with a small square in the right-hand margin of the problem line so they can be located quickly by a human. It also suppresses the inclusion of images and shows only a frame where they would normally occur.

https://en.wikibooks.org/wiki/LaTeX/Document_Structure

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documentclass options []

• See also

https://texblog.org/2013/02/13/latex-documentclass-options-illustrated/
demo_classOptions.tex

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Extending the default classes

- The built-in classes come built into every installation of LATEX and are therefore guaranteed to format identically everywhere.
- For some purposes you must use LATEX packages to extend these classes to do what you need.
  - The `memoir` package and the `komascript` bundle contain more sophisticated replacements for all the built-in classes.
  - Many academic and scientific publishers provide their own special class files for articles and books.
  - Conference organisers may also provide class files for authors to write papers for presentations, preprints, or proceedings.
  - Many universities provide their own thesis document class files in order to ensure exact fulfilment of their formatting requirements.
- Check https://www.ctan.org/topic/class

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Hands-on

- Make a first LaTeX document: create a document showing the famous *Hello World!* sentence
  file: HelloWorld.tex
- Use a larger document, to check the influence of the documentclass
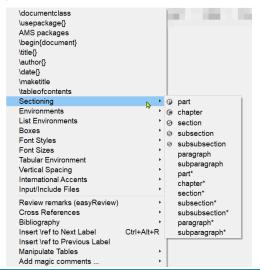 (use Lorem Ipsum https://www.lipsum.com/)
  file: FirstDocument.tex
- Valid documentclass
  - *article*
  - *report*
  - *book*
  - *letter*

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Document structure according to LaTeX

- A document is split into logical parts:
  - A title + author
  - An abstract
  - Text / Sectioning
  - Bibliography
- Typesetting of the sections may vary depending on document class


```
\documentclass
\usepackage{}
AMS packages
\begin{document}
\title{}
\author{}
\date{}
\maketitle
\tableofcontents
Sectioning                          ▸    ⓟ part
Environments                        ▸    ⓒ chapter
List Environments                   ▸    ⓢ section
Boxes                               ▸    ⓢ subsection
Font Styles                         ▸    ⓢ subsubsection
Font Sizes                          ▸         paragraph
Tabular Environment                 ▸         subparagraph
Vertical Spacing                    ▸         part*
International Accents                ▸         chapter*
Input/Include Files                 ▸         section*
                                              subsection*
Review remarks (easyReview)         ▸         subsubsection*
Cross References                    ▸         paragraph*
Bibliography                        ▸         subparagraph*
Insert \ref to Next Label   Ctrl+Alt+R
Insert \ref to Previous Label
Manipulate Tables                   ▸
Add magic comments ...              ▸
```

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Title, author

- After `documentclass` and package(s) command, enter information about the document.
  https://tex.stackexchange.com/questions/92702/should-i-place-title-author-date-in-the-preamble-or-after-begindocument
- Place the title and author in the preamble
  - consider it as meta data to the document
  - `\title{`*Title of Document*`}`
  - `\author{`*Author's Name*`}`
- Generate the title page, at the beginning of the document:
  `\begin{document}`
  `\maketitle`
- *File: demo_title.tex*

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Title, author

- For multiple authors, separate the names with `\and`.
- create more fields by not closing the *author* command and inserting a line break.
  ```
  \author{I am Writer \\
  This University}
  ```
- `\date{text}`
  - Optional
  - no `\date` generates the current time at compilation.
  - Insert `\date{desired date}` in the preamble to fix a date.
  - `\date{}` no date in the title
- `\thanks{text}`
  - Optional.
  - Produces a footnote.
  - Use it in any place a footnote makes sense. It can be used for any purpose, such as to print an email address, acknowledgments, etc..

Title, author

- If you don't like the layout from `maketitle`, you can make your own title page using the `titlepage` environment:
  ```
  \begin{titlepage}
  Title page text
  \end{titlepage}
  ```
- The easiest way to add author affiliations is with the `authblk` package.
- *File: demo_authblk.tex*
- See also
  - https://en.wikibooks.org/wiki/LaTeX/Title_Creation
  - http://tug.ctan.org/info/latex-samples/TitlePages/titlepages.pdf

Abstract

- Used to give an overview of the content of the document.
- Not defined in `book` documentclass
- Is usually typeset with wider margins than the main text.
- Specified using the abstract environment:

```
\begin{abstract}
        …
\end{abstract}
```

Text - paragraphs

- Put text in well-structured paragraphs
- Plain text is written on one line
- Paragraphs are created by leaving one (or more) line(s) blank
- **** will force a new line to be started, but not a new paragraph.
- `\newline` does the same as \\
- new page:
  - `\newpage`: forces a new page
  - `\clearpage`: forces a new page, but first puts all previous tables, figures, etc. in the document.

Text - paragraphs

- `\par` performs the same action as a blank line
- A paragraph is indented by default
    - `\indent` indents a paragraph
    - `\noindent` doesn't indent a paragraph
- Use `\setlength{\parindent}` in the preamble to change the indentation (no indent when set at 0mm)
- Use `\setlength{\parskip}` in the preamble to adjust the space between paragraphs
- *File: text_paragraph.tex*
- *File: text_paragraph_indent.tex*

Text - paragraphs

- `\linebreak[number]`
- tells LaTeX to break the current line at the point of the command.
- Number: between 0 – 4. The higher the number, the more insistent the request is.
- *File: demo_paragraph_newlinebreak*

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comment

- Single line comments using the percent character:
  `% this is a comment`
- When LaTeX encounters a `%` character while processing an input file, it ignores the rest of the present line.
- This can be used to write notes into the input file, which will not show up in the printed version.
- Take advantage of this! Comment as much as possible.

- Texstudio > Idefix > comment / uncomment
- *File: comment_1.tex*

---

comment

- Multiple line comments (include the verbatim package)
- `\usepackage{comment}` in preamble.

```
\begin{comment}
 This is my comment.
 Note that it can span multiple lines.
 This is very useful.

\end{comment}
```

- *File: comment_2.tex*

- Use comment package to include/exclude specific portions of text.

Hands-on

- Type some text and check the influence of putting line breaks, blanks, indentation, …

- *File: text_paragraph.tex*
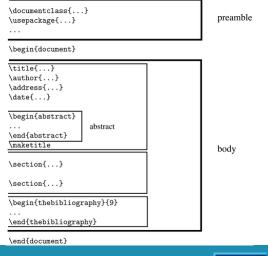- *File: text_paragraph_indent.tex*

Document structure

- LaTeX provides sectioning commands to structure text into units. These are all optional.
- All sectioning commands take the same general form, i.e.,
  - `\section_type{Some section title here}`
  - This will automatically create the title and numbering of the section.

	level	book	report	article	letter
\part{part}	-1	X	X	X	
\chapter{chapter}	0	X	X		
\section{section}	1	X	X	X	
\subsection{subsection}	2	X	X	X	
\subsubsection{subsubsection}	3	X	X	X	
\paragraph{paragraph}	4	X	X	X	
\subparagraph{subparagraph}	5	X	X	X	

Document structure according to LaTeX

- Front matter:
  - first part of the body. It is concluded with the \maketitle command.
- Main matter:
  - main part of the document, including any appendices.
- Back matter:
  - material that is typeset at the end of the document.
    - the bibliography
    - the index

```
\documentclass{...}
\usepackage{...}
...

\begin{document}
```
preamble

```
\title{...}
\author{...}
\address{...}
\date{...}

\begin{abstract}
...                    abstract
\end{abstract}
\maketitle

\section{...}

\section{...}

\begin{thebibliography}{9}
...
\end{thebibliography}

\end{document}
```
body

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Document structure according to LaTeX

```
\documentclass{article}
\title{Introduction to \LaTeX{}}
\author{Author's Name}
\begin{document}
\maketitle
\begin{abstract} ... \end{abstract}
…
\section{Heading of the First Section}
\subsection{Subsection Heading Here}
…
\end{document}
```
File: demo_structuring.tex

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```
\documentclass[a4paper]{article}
%
% demo_headings.tex
%
\begin{document}

\section{A section}
Some text here.

\subsection{A subsection}
Some text here.

\subsubsection{A subsubsection}
Some text here.

\paragraph{A paragraph} Some text here. You won't
use \verb"\paragraph" very often.

\subparagraph{A subparagraph} Some text here.
You will use \verb"\subparagraph" even less
    often.

\end{document}
```

Chapter 1

Test

1.1 A section

Some text here.

1.1.1 A subsection

Some text here.

A subsubsection

Some text here.

A paragraph   Some text here. You wont (or is it won't) use **\paragraph** very often.

   A subparagraph   Some text here. You will use **\subparagraph** even less often.

- *File: demo_headings.tex*

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How to show subsections and subsubsections in TOC?

- Increase the value of tocdepth and secnumdepth.
- The tocdepth value determines to which level the sectioning commands are printed in the ToC (they are always included in the .toc file but ignored otherwise).
- The secnumdepth value determines up to what level the sectioning titles are numbered.
- https://tex.stackexchange.com/questions/17877/how-to-show-subsections-and-subsubsections-in-toc
- *File: demo_structuring_2.tex*

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Autonumbering

- Stop autonumbering
  - `\section*{`*`Section Name`*`}`
  - `\chapter*{`*`Chapter Name`*`}`
- use the * to also stop sectioning commands from numbering.
  - will put the title above the section or chapter, but without the autonumbering.
  - No entry in table of contents
- *File: demo_sectioning.tex*

Long titles

- Chapters or sections may have long names that we don't want to have in our table of contents.
- Use brackets to make a name that appears in the body of our paper and another name in the table of contents.
  `\section[`*`Table of Content's Name`*`]`
  `{`*`The Longer Name for the Actual Paper`*`}`
- Can be used with parts, chapters, subsections, etc.

Hands-on

- Type some text and check the influence of the sectioning commands
- Remarque the automated numbering, try also to use a sectioning command without numbering (*).
    - Is it visible in the table of contents?
    - Filling up the table of contents, requires an extra compilation
- *File: sectioningcommands.tex*

Table of contents

- Create automatically a table of contents:
  `\tableofcontents`

  as long as you use sectioning commands (headings).
- Recommended position of the table of contents:
    - just after `\maketitle`;
    - just after the abstract;
    - at the end of the document.
- You may also include a list of figures and a list of tables using
  `\listoffigures` and `\listoftables`

Hands-on

- Take the file used in the sectioning example, or start a new file.
- Make a title page
- Include a table of contents
- Include an abstract
- Change the documentclass; try: `article, report, book`
- *File: title_contents.tex*
  file: abstract.tex

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Summary

- Add plain text
- Get some structure in your content
- Add an abstract
- Add a title and author

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