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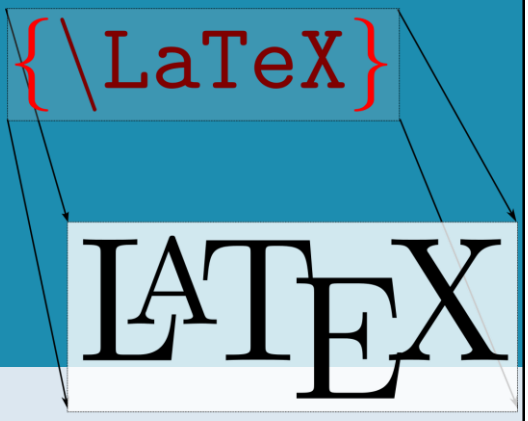
Introduction to LaTeX



https://en.wikibooks.org/wiki/LaTeX#/media/File:LaTeX_cover.svg

A first document

Contents

- LaTeX file anatomy
- LaTeX command
- `documentclass`
- LaTeX document structure

A minimal LaTeX document

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

Small, but **beautiful**.

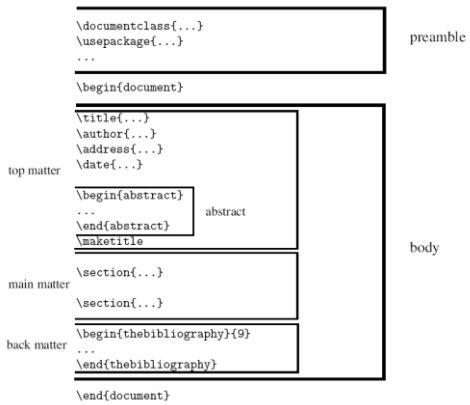
File:firstdoc/minimal-document.tex

LaTeX file anatomy

.tex source file

preamble:
- global parameters
- packages in use

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



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)
      - Packages: external bodies of code that provide extra capabilities or extend LaTeX's basic features.
        - Packages are distributed through CTAN (https://www.ctan.org/), which currently has more than 6000 available.
        - Imported using the command
          `\usepackage[<options>]{<packagename>}` 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}`

LaTeX command

`\command`

LaTeX command

Commands take one of two forms:

- a backslash (\) followed by a single special character
  - Characters with a special meaning: `# $ & ~ _ ^ % { }`
  - `\ \textbackslash`
  - `\{ \} \% \$ \&`
- a backslash (\) followed by a string of letters
  - Command names are case sensitive
  - Commands may have mandatory arguments, which are input in braces {}.
  - They may also have optional arguments, which are input in square brackets [].
  - \command{*argument*}

LaTeX command

- 2 kinds of markup commands
  - **Logical** markup
    focus on the logical structure of the document
    should be the way to go: LaTeX is taking care of the formatting
    ```
    \title{Computational Physics}
    \section{Projectile motion}
    ```
  - **Typographical** markup
    directly set the appearance
    `\textbf{hello} world` = **hello** world
- 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 `[]`
  - Scope of the command is **local**, acting only on the mandatory argument
- Example
  - `\documentclass[12pt]{article}`
  - `\usepackage{package name}`
    - `\usepackage[dutch]{babel}`
  - `\emph{emphasized text}`
    - May not cover multiple paragraphs! Local scope

Inline command

- Commands with local scope do not work on multiple paragraphs

```
\textbf{ hello world!

Have a nice day!}
```

- Will generate a compilation error
- Use a declaration

```
\bfseries  hello world!

Have a nice day!
```

Declaration

- A **declaration** is a LaTeX command that does not act on an argument, but which changes the way LaTeX prints the following text or which changes the value or meaning of some command or counter.
- `\large`
- The scope of a declaration begins with the declaration command itself and is ended by the first right brace (}) or \end{} command whose matching left brace ({) or \begin{} precedes the declaration.
- Every declaration has an environment of the same name.
- If \decl is a declaration command, then
- `{\decl .... }`
  - Pair of {} is defining a **group**.
- can also be used as
- `\begin{decl} .... \end{decl}`

Environment command

- Environment commands tell LaTeX what to do with specific blocks of text. They always include `begin` and `end` commands.
  - `\begin{name}` `\end{name}`
- Can have arguments and optional parameters
  - `\begin{name}[optional]{mandatory}`
  - …
  - `\end{name}`
- Example
  - `\begin{document}` `\end{document}`
  - `\begin{itemize}` `\end{itemize}`

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}
```


What document?

`\documentclass`

documentclass

- The first information LaTeX needs to know: type of document
  `\documentclass[options]{class}`
- Default 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

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 []

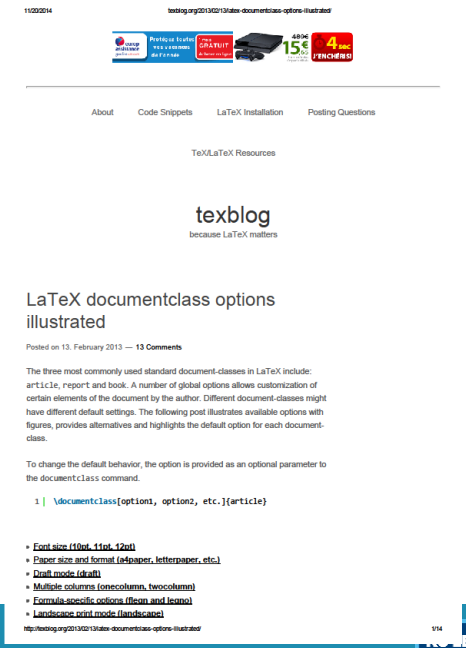
`10pt, 11pt, 12pt`	Sets the size of the main font in the document. If no option is specified, 10pt is assumed.
`a4paper, letterpaper,...`	Defines the paper size. The default size is letterpaper; However, many European distributions of TeX now come pre-set for A4, not Letter, and this is also true of 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

documentclass options []

- See also

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


11/20/2014 texblog.org/2013/02/13/latex-documentclass-options-illustrated/

About Code Snippets LaTeX Installation Posting Questions

TeX/LaTeX Resources

texblog
because LaTeX matters

LaTeX documentclass options illustrated

Posted on 13. February 2013 — 13 Comments

The three most commonly used standard document-classes in LaTeX include: `article`, `report` and book. A number of global options allows customization of certain elements of the document by the author. Different document-classes might have different default settings. The following post illustrates available options with figures, provides alternatives and highlights the default option for each document-class.

To change the default behavior, the option is provided as an optional parameter to the `documentclass` command.

```
1 | \documentclass[option1, option2, etc.]{article}
```

- Font size (10pt, 11pt, 12pt)
- Paper size and format (a4paper, letterpaper, etc.)
- Draft mode (draft)
- Multiple columns (onecolumn, twocolumn)
- Formula-specific options (fleqn and leqno)
- Landscape print mode (landscape)

http://texblog.org/2013/02/13/latex-documentclass-options-illustrated/ 1/14

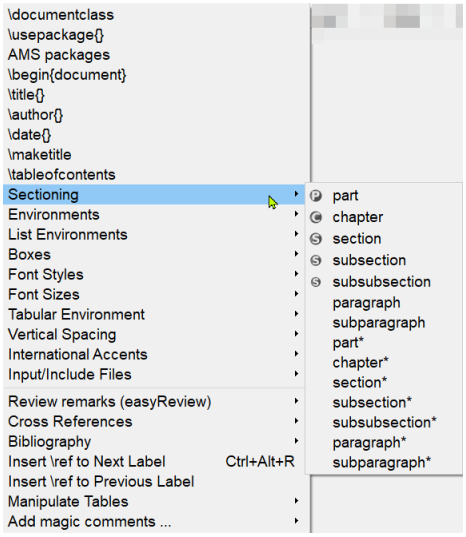
Extending the default classes

- 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 organizers 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

Hands-on

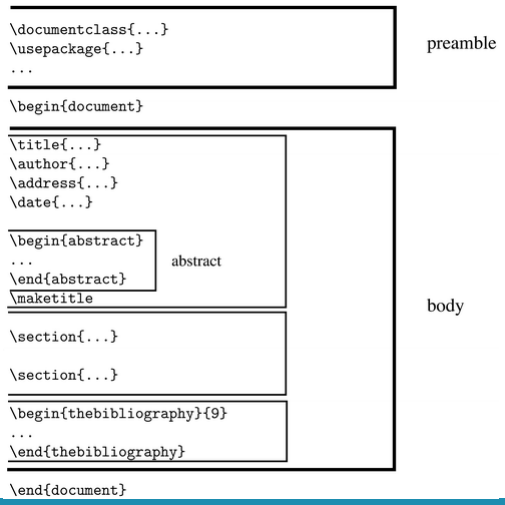
- Make a first LaTeX document: create a document showing the famous *Hello World!* sentence
  file: HelloWorld.tex
- Use a larger document, to check the influence of the documentclass
  (use Lorem Ipsum https://www.lipsum.com/)
  file: FirstDocument.tex
- Valid documentclass
  - *article*
  - *report*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

Document structure



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



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

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{`*`Name Surname`*`}`
- Generate the title page with `maketitle`, at the beginning of the document:

```
\begin{document}
\maketitle
```

- *File: demo_title.tex*

Title, author

- For multiple authors, separate the names with `\and`.
- `\author{`*`Name1 Surname1 \and Name2 Surname2`*`}`
- 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}
```
- `titlepages` package
- `authblk` package: add author affiliations
- *File: demo_authblk.tex*
- See also
  - https://www.overleaf.com/gallery/tagged/title-page
  - 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}
```


Document structure

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

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

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 or with `\par`
- `\newline` will force a new line to be started, but not a new paragraph.
  - `\\` is also used, but caution is needed, may act differently depending on the environment
- 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

- 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*

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*

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 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

Numbering

- All document divisions get numbered automatically.
  - Parts get Roman numerals (Part I, Part II, etc);
  - Chapters and sections get decimal numbering;
  - Appendixes (which are just a special case of chapters, and share the same structure) are lettered (A, B, C, etc) switched on with `\appendix`

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.

Appearance of headings

- `tocdepth` controls which sectioning units are listed in the table of contents.
  - LaTeX's default tocdepth is 3 in article class and 2 in the book and report classes.
- `secnumdepth` controls which sectioning unit are numbered.
  - Setting the counter with `\setcounter{secnumdepth}{level}` will suppress numbering of sectioning at any depth greater than level (see \setcounter).
- https://tex.stackexchange.com/questions/17877/how-to-show-subsections-and-subsubsections-in-toc
- *File: demo_structuring_2.tex*

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*

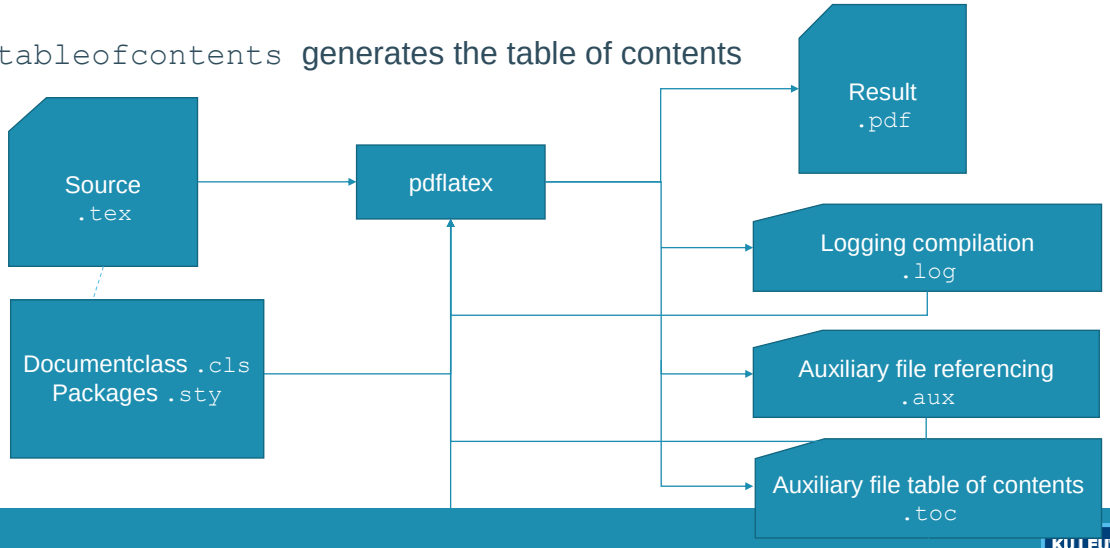
Table of contents

- 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`

Table of contents

- `\tableofcontents` generates the table of contents



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