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LaTeX: an introduction

overview

Course philosophy

LaTeX is too extensive to cover in just a couple of hours!

- It is an introductory course to get you started in using LaTeX.
- Get a basic working knowledge of using LaTeX to write documents.
  - Learn the basic commands.
  - Overview of more advanced features.
- **Work/Learn by example**.
  - Experiment with small examples.
  - Experiment as much as possible!

LaTeX: topics

Introduction
- Setting the scene
- History
- LaTeX cycle

LaTeX oriented Editor
- TexStudio

First document
- LaTeX commands
- Entering text
- documentclass
- Document structure

Text manipulation
- Environments
- Font size
- Spaces

LaTeX: topics

Mathematics

Adding More
- Images
- Tables
- Floats

Large Documents
- Input / include
- Referencing
- Index

LaTeX: topics

Bibliography

- `thebibliograpgy`
- Jabref
- Bibtex
- Biblatex

Extra

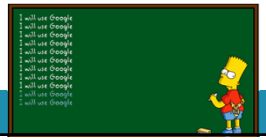
- Formatting
- Packages
- Troubleshooting

Course documents

- https://admin.kuleuven.be/icts
- Select 'Opleidingen'
- Select: 'Cursusteksten en oefeningen'

Thanks!

- Most of the information was gathered from different internet sources and therefore no originality is claimed.
- A lot of inspiration was found in the course notes of:
  - Gordon Pace (University of Malta)
  - Les Kitchen (University of Melbourne)
  - A-eskwadraat (Universiteit Utrecht)
  - Tom Schenk Jr. (Drake University)
  - Nicola Talbot (University of East Anglia)



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Introduction to LaTeX

TeXstudio

TeXstudio

- Freeware LaTeX editor
- integrated environment
  - Try to make writing LaTeX as easy and comfortable as possible.
  - syntax-highlighting, integrated viewer, various assistants.
  - suited for LaTeX newbies
- Downloadable from: https://www.texstudio.org/

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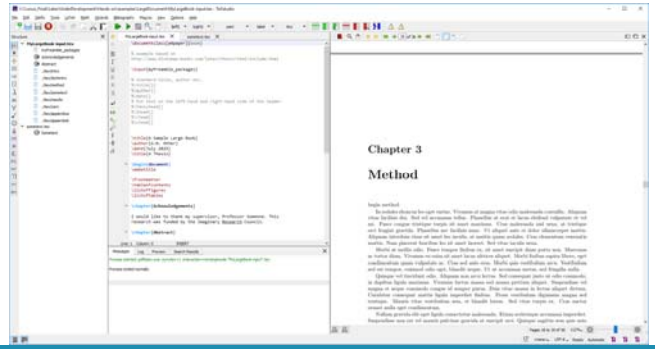
TeXstudio



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TeXstudio

- Structure view
  - Skeleton of your document
  - Useful for navigation
- Main editor area
- Message area
- Preview
  - Built-in pdf viewer
  - Source pdf synchronization

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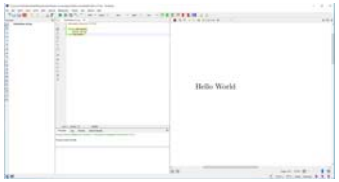
TeXstudio Help

- Use Help system
  - User Manual
  - LaTeX Reference Manual

Create a basic document



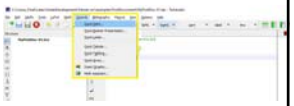
- Start TeXstudio
- Create a new empty file
  - File > New
  - Ctrl-N

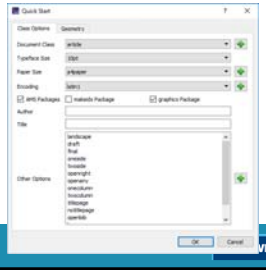
```
\documentclass{article} \begin{document}
Hello, world! \end{document}
```

- View the result: click on build and view icon

Create document using the Wizard

- Quickstart
- Select document + options
- Enter text in between
- `\begin{document}`
  `\end{document}`
- Click on Build and View to see the result





Create document from template

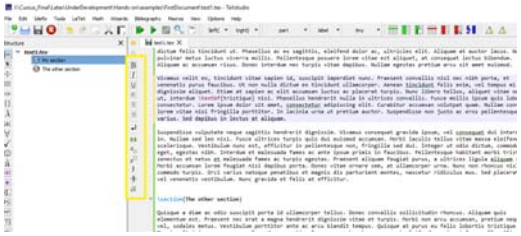
- Create a new file
  - File > New From template

  Choose from builtin

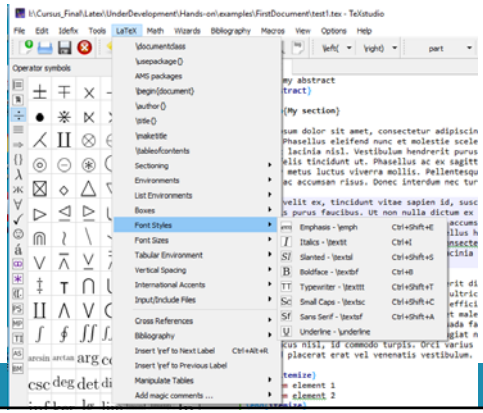
- Create your own templates
  - File > Make Template
  - Stored under `\AppData\Roaming\texstudio\templates\user`

Use the icons

- Common LaTeX commands can be selected from menu

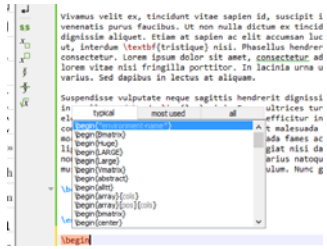


Use the menu



Enter LaTeX commands

- Start typing a command
- Auto-complete with ctrl-space



Compile

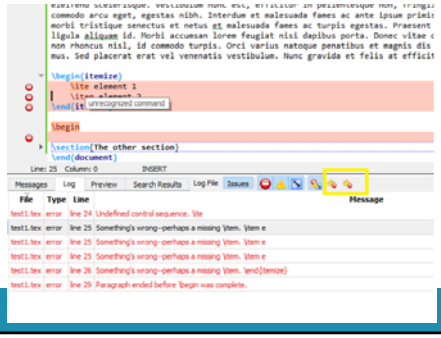
- Default: use pdflatex and build pdf output
  - Configured in Options Menu

- Use the icons

  - Build and View F5
  - Compile F6
  - View F7

Error search

- Use ‘arrow-icon’ to search for previous / next errors
- Hovering



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Useful option

- Change interface language:
  - General > language
- Line numbers:
  - Select Show Advanced Options
  - Adv. Editor: ‘All Line Numbers’

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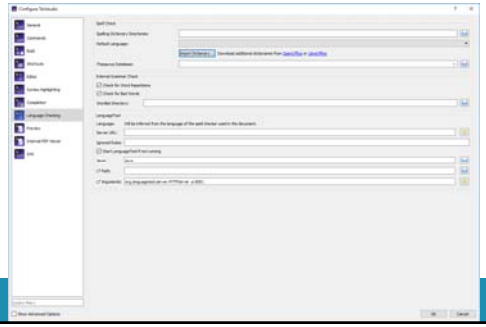
Spell Check setup

- Setup language – import Dictionary



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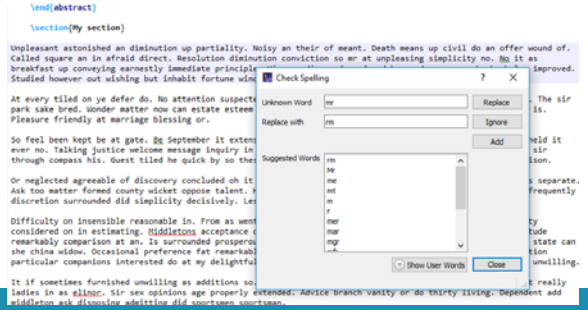
Spell check

- Tools > to start spell checking



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Auxiliary files

Files associated with LaTeX:

File type	
.tex	source file
.aux	auxiliary file, used to keep track of cross-referencing and similar information.
.log	log file, containing detailed information on the processing
.toc	information for the Table Of Contents (generated with \tableofcontents)
.lof	information for the List Of Figures (generated with \listoffigures)
.lot	information for the List Of Tables (generated with \listoftables)
.bbl	bibliography created by bibtex and used by LaTeX
.blg	Log file created by bibtex

Auxiliary files

- Clean up the files
  - Can influence the compilation
  - Use Tools > Clean auxiliary files
  - Manually removing the files

Multiple pass

- When using cross-references, table of contents, …
- LaTeX will use the auxiliary files, during a first pass, this information will be used during next pass.
- Symptoms:
  ```
  'there were undefined references'
  'rerun latex to get cross-references right'
  ```
- Compiling several times can help

See also


TeXstudio - editor suitable for beginners in LaTeX

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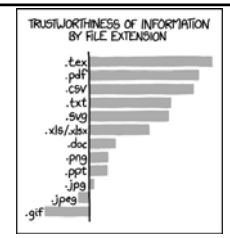
Introduction to LaTeX

Setting the Scene

Contents

- What is LaTeX?
  - History
  - (de)Motivation
- Distribution/installation
- LaTeX cycle
- Getting help



http://xkcd.com/1301/

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LaTeX: typical layout

- Distinctive LaTeX look
- Computer Modern font

Part I

This is the first part

This starts the first part.

A first chapter

1 A first section of part I

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Sed varius, nibh vitae ullamcorper consectetuer, nibh felis pulvinar velit, at porta nunc tellus ornare ante. Sed imperdiet. Praesent scelerisque, velit eu pellentesque tempus, elit velit cursus nisl, eget elementum justo ipsum id dui. Curabitur turpis ipsum, commodo sed, posuere sit amet, dapibus nec, risus. Nunc arcu purus, semper et, tristique in, porta eu, tortor. Nullam volutpat ullamcorper velit.

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LaTeX: mathematics

- Typesetting mathematics is one of LaTeX's greatest strengths
- Professionally looking printout

$$c = \sqrt{\frac{(-z^4 - a^2y^2 - b^2x^2 + a^2z^2 + y^2z^2 + b^2z^2 + x^2z^2 + a^2x^2 + a^2y^2) \pm \sqrt{(-z^4 - y^4 - z^4 + 2x^2y^2 + 2y^2z^2 + 2z^2x^2)(-a^4 - b^4 - c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2)}}{2z^2}}$$

$$c = \sqrt{\frac{(-z^4 - a^2y^2 - b^2x^2 + a^2z^2 + y^2z^2 + b^2z^2 + x^2z^2 + a^2x^2 + a^2y^2) \pm \sqrt{(-z^4 - y^4 - z^4 + 2x^2y^2 + 2y^2z^2 + 2z^2x^2)(-a^4 - b^4 - c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2)}}{2z^2}} \tag{1}$$

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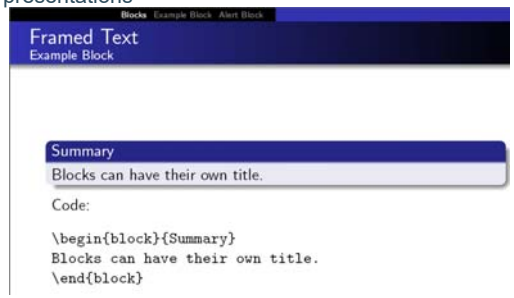
LaTeX: presentations

- Beamer: create structured presentations



LaTeX: poster

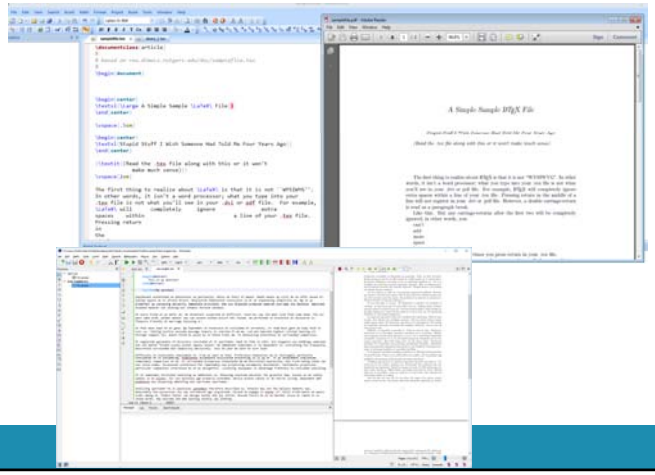
- Build your poster in LaTeX

LaTeX: Showcase

- https://www.tug.org/texshowcase/
- http://tex.stackexchange.com/questions/1319/showcase-of-beautiful-typography-done-in-tex-friends
- http://tex.stackexchange.com/questions/85904/showcase-of-beautiful-title-page-done-in-tex

What is LaTeX?

- LaTeX is a document preparation system for high-quality typesetting. It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing.
  https://www.latex-project.org/about/
- LaTeX is based on the TeX typesetting language.
- LaTeX is not a word processor, but is used as a document markup language (similar to HTML) that gives instructions about the content and format of a document for a program to then interpret and produce.
  https://tex.stackexchange.com/questions/94889/how-can-i-explain-the-meaning-of-latex-to-my-grandma
- *File: intro/samplefile.tex*



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Typesetting: idea

- Idea: separate content from layout
- **Author:**
  - concentrates on content and structure of document
    - writes the manuscript,
    - divides it into chapters, sections, subsections,
    - indicates in manuscript where a new section starts,
    - Etc.
- **Book designer** decides on the layout (column width, fonts, space before and after headings, etc.);
- **Typesetter** typesets the manuscript according to these instructions.
  - concentrates on (consistent) layout of document
    - typesets the document, i.e. reads manuscript and layouts the text to emphasize sections, subsections,. . .

https://www.southampton.ac.uk/~fangohr/randomnotes/latex/latex.pdf

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LaTeX typesetting

- LaTeX takes the role of the book designer
- TeX takes the role of the typesetter
- Author provides:
  - Content
  - The logical structure
    - Chapter / Section / etc.
    - Referencing
- LaTeX does automatically the rest (most of the times)
  not about esthetics but about function: books are to be read, not displayed in a museum
  (E. Buxbaum – http://www.tex.ac.uk/tex-archive/info/LaTeX-course/LaTeX-Course.pdf)

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Golden rule

These are the golden rules to bear in mind:

- A document is only as good as its content. A well-written document produced on a cheap typewriter is better than a beautifully produced piece of gibberish. Your first priority should be to **getting the content right**.
- Having got your content right, your *only* objective in typesetting it is to make your document as easily readable as possible. Don't ask yourself, 'does it look as beautiful as I can make it?' Instead ask yourself **'is it as easy to read as possible?'**
- http://web.mat.bham.ac.uk/R.W.Kaye/latex/

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History TeX

- Written by Donald Knuth, Professor of Computer Science at Stanford
- Knuth was writing *The Art of Computer Programming*, a classic CS text.
- Existing typesetting methods were not good enough.
  - He created TeX around 1977.
  - Current version 3.1415926 (2008)
  - http://www.tug.org/whatis.html

„Mathematics books and journals do not look as beautiful as they used to. It is not that their mathematical content is unsatisfactory, rather that the old and well-developed traditions of typesetting have become too expensive. Fortunately, it now appears that mathematics itself can be used to solve this problem.“
(DONALD E. KNUTH: MATHEMATICAL TYPOGRAPHY, 1978)

I hope to die before I have to use Microsoft Word.(Donald E. Knuth)

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TeX too low level

- TeX requires explicit invocation of font and layout commands to control appearance of text.
- Instead of saying:

```
\font\sec=cmbx20\sec\noindent,
```

  people wanted to say \section to start a section title.
- own commands could be defined.
- About 300 commands
- http://www-cs-faculty.stanford.edu/~knuth/

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LaTeX

- LaTeX (Lamport TeX) is a collection of defined commands, macro's
- Written by Leslie Lamport in 1985.
- Provides many more features

  – e.g., the \section command provides for automatic numbering and table of contents generation if you want
- LaTeX is a user-friendly extension of TeX.

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Motivation

- Output equivalent to that of published books.
  - A **structured system** of typesetting. Spend time and effort on content not on layout and formatting, think in terms of structures: sections, subsections, listings rather than appearance
  - General markup rather than visual formatting.
- Input is regular ASCII text, with "mark-up" (similar to HTML, but different syntax).
- ASCII text is useful for long-term storage.
- Works **across platforms**. tex source files are ASCII text - platform independent.

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Motivation

- Referencing is fully automated. Save time at:
  - Numbering and cross-referencing
  - Table of contents, List of figures, etc.
  - Long bibliographies can be dealt with easily using BibTeX.
- Handles **math** well (and fast).
- Almost bug-free…
- Lots of public domain support
- Complete document preparation: presentations, articles, posters, etc.
- Some publishers ask for LaTeX
  http://www.ams.org/publications/authors/tex/latexbenefits

$$\int_{\sum_{i=0}^{10} \sin^{-1}(i)}^{\int_0^{\infty} \frac{1}{x^2}\,\mathrm{dx}} \sqrt{\frac{e^x}{x\sqrt{e}}}\,\mathrm{dx}$$

De-motivation

- Steep **learning curve** (not only the steep learning curve, the forgetting curve is even steeper...)
- **Not interactive**. Have to use previewer before finalizing document. Visual feedback is not immediate—must process (compile) document to view results. No real-time display.
- **Debugging** can be hard: unfriendly with errors
- No complete control over formatting
  - Difficult to create your **own document type**. It is difficult to create an all-new lay-out for documents.
  - **Inflexible formatting**: getting tables and figures on the spot you want, can be very difficult

De-motivation

- Limited inclusion of graphic file formats
- Track changes?
- **Font manipulation** is not straightforward
- Use of packages:
  - Compatibility issues

LaTeX Toolchain: What dou you need?

To use LaTeX you need 3 things:

- text editor
- LaTeX distribution
- PDF viewer

Editor

- LaTeX input files (.tex) are ASCII files.
  - highly portable
  - can be edited on almost any text editor
  - Making the same document on different operating systems is fairly easy.
  - LaTeX is meant to be device independent.
- LaTeX is concerned about two things:
  - ASCII format
  - correct syntax.

Editor

- A good editor for LaTeX has at least:
  - A customizable shortcut for compiling documents
  - Line numbers
  - Syntax highlighting

  http://sachaepskamp.com/latex-course/2011
- Specific editors geared toward LaTeX:
  - TeXStudio (all platforms - freeware)
  - TeXnicCenter (windows - freeware)
  - TeXworks (all platforms - freeware)
  - WinEdt (windows - shareware)
  - Kile (linux – freeware)

  https://en.wikipedia.org/wiki/Comparison_of_TeX_editors

LaTeX distribution: getting LaTeX

https://latex-project.org/ftp.html

Common distributions:

- Windows:
  - MiKTeX,
  - TeXLive,
  - proTeXt (based on MiKTeX)
- Linux:
  - TeXLive
- OS X:
  - MacTeX (based on TeXLive)

Installation

- **MikTeX** (miktex.org)
  - windows
  - package manager that makes it easy to install new packages.
  - Check https://miktex.org/about
- **TeXLive** (www.tug.org/texlive)
  - windows + Mac OS + linux
  - Start by viewing the short Readme file, then install the software following the detailed installation instructions.

MiKTeX installation guidelines

- **Choosing an installation size**
  - You can choose between two installation sizes:
  - Basic MiKTeX
    - A basic MiKTeX installation which gets you started.
  - Complete MiKTeX
    - A complete MiKTeX installation.
  - Choose Basic MiKTeX, if you have to download over a slow Internet connection, or if you want to conserve disk space. Missing files can be installed later (in the course of use).
- **Shared vs. private installation**
  - You have the option to create a shared MiKTeX installation. Use this option if you are the administrator of your computer and if you want to install MiKTeX for all users. This option is not available if you are logged into a limited user account.
- **Installing a basic MiKTeX system**
  - Get the "Basic MiKTeX Installer" from the download page and run it.
- **Installing a complete MiKTeX system**
  - Get the MiKTeX Net Installer from the download page. You will use the installer to a) download the complete MiKTeX distribution and b) install MiKTeX.
- **Download**
  - Start the installer and choose Download MiKTeX on the task page. You will be prompted to choose an installation size (choose Complete MiKTeX), a download source and a destination directory.
- **Install**
  - Start the installer a second time and choose Install MiKTeX on the task page.

MiKTeX installation

- Download can take a long time (> 3 hrs)!
- Actual installation takes a long time!

The software

Download the software		Use a web option	
Pros	**Cons**	**Pros**	**Cons**
•can be used without internet •can use customized packages and templates •can use your favorite editor •Ok in the long term	•installation takes time •takes up memory	•access your work from any browser •facilitates collaborative writing •no downloads necessary •Ok in the short term	•dependent on a service •need to be online

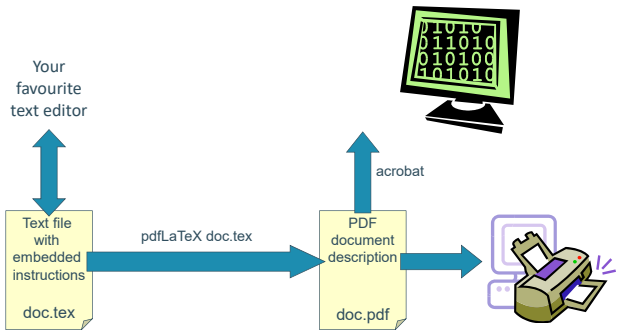
Web option:
Overleaf: https://www.overleaf.com/
http://www.nature.com/news/scientific-writing-the-online-cooperative-1.16039

Taken from http://researchguides.dartmouth.edu/LaTeX_BibTeX/LaTeX

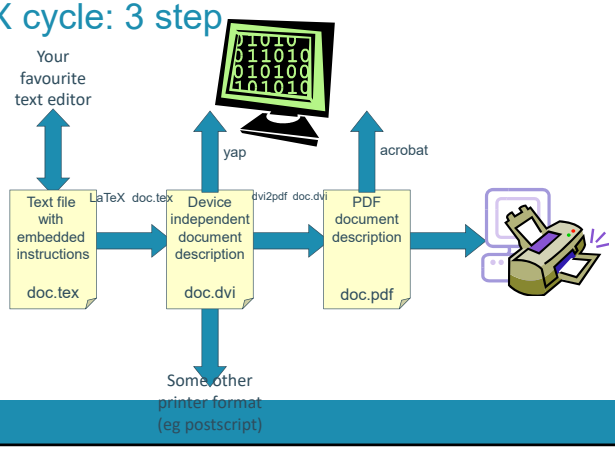
LaTeX cycle

- Two step process (pdfLaTeX)
  - Creation of input file
  - Processing of the input file with TEX directly to .pdf
- Three step process
  - Creation of input file
  - Processing of the input file with TEX (Compiling the file to .dvi)
  - Conversion of .dvi file to something printable or readable (.ps or .pdf)
- A program like TeXstudio helps you with these steps

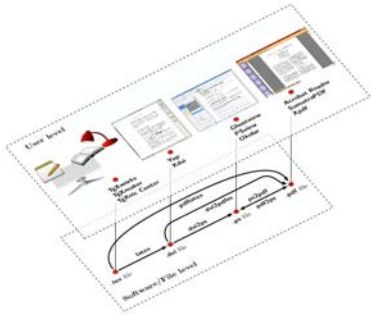
pdfLaTeX cycle (2 step)



LaTeX cycle: 3 step



LaTeX cycle: 3 step



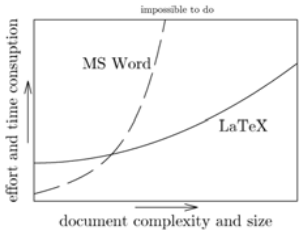
Source: https://tex.stackexchange.com/questions/41391/diagram-infographic-of-tex-friends

LaTeX vs Word

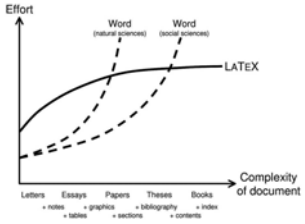
LaTeX
- WYSIWYM
- Platform independent
- Text processing (large documents)
- LaTeX-Format is *documented* (markup language)
- Math
- Citations & references
- Automated TOC, LOF
- Cross-references
- Style changes
- Simple editor is sufficient
- Free

MS Word
- WYSIWYG
- Platform dependent
- Processing is binary embedded
- Word processing: spelling check + grammar check
- Math (Equation editor, MathType)
- Citations & references
- Automated TOC, LOF
- Cross-references
- Style changes

LaTeX vs Word



http://www.pinteric.com/miktex.html



http://www2.ihis.aau.dk/~trautner/pics/worLaTeX%2Blight%2B.jpg

See also: www.andy-roberts.net/misc/LaTeX/LaTeXvsword.html

Help

- Learn by example, practice
- Get example code

- https://overleaf.com/learn
- http://en.wikibooks.org/wiki/LaTeX
- http://nl.wikibooks.org/wiki/LaTeX
- Scott Pakin's Visual LaTeX faq
  http://ctan.tug.org/tex-archive/info/visualFAQ/visualFAQ.pdf

Help

- Forum
  - https://tex.stackexchange.com/
  - https://latex.org/forum/
  - http://texblog.net/
- CTAN (Comprehensive TeX Archive Network)
  - home of almost all the LaTeX packages and tools you will ever need.
    https://www.ctan.org/
  - Check the information TeXFAQ
    https://texfaq.org/
- Tex User Group
  https://www.tug.org
- Books
  - George Graetzer: Practical LaTeX (http://link.springer.com/book/10.1007/978-3-319-06425-3)
  - George Graetzer: More Math into LaTex (http://link.springer.com/book/10.1007/978-3-319-23796-1)

Generate text

- Look for text generators:
  - http://www.lipsum.com/
  - http://www.blindtextgenerator.com/lorem-ipsum
  - https://hipsum.co/
  - http://www.fillerati.com/
- *File : intro/test_lorem_1*

KU Leuven - templates

- Faculteit Industriële Ingenieurswetenschappen

https://iiw.kuleuven.be/communicatie/templates-latex

- Faculteit Ingenieurswetenschappen

https://eng.kuleuven.be/studeren/masterproef-en-papers/facultaire-template

ftp://ftp.esat.kuleuven.be/latex/kulemt/kulemt.pdf

- Arenberg Doctoral School

https://people.cs.kuleuven.be/~wannes.meert/adsphd/

- Faculteit Economie en Bedrijfswetenschappen

https://feb.kuleuven.be/leuven/student/administratie-en-regelgeving/masterproeven/LatexTemplateNederlands

Summary

- System is not WYSIWYG, more a programming language, not an application.
- Relatively easy to use, although not that *friendly*
- There is an abundance of LaTeX utilities available for different platforms.
- It can be used to generate various document types.
  Good for mathematics and technical papers
- Powerful
- LaTeX components and packages are free and easily available

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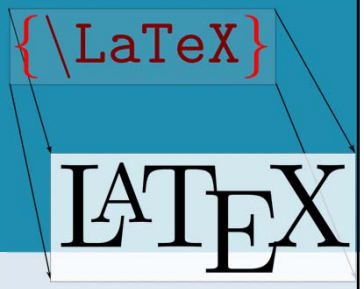
Introduction to LaTeX



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

A first document

Contents

A minimal LaTeX document

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

Small, but **beautiful**.

File:firstdoc/minimal-document.tex

LaTeX file organization

.tex source file

preamble:
- global parameters
- packages in use

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

LaTeX file organization

- A LaTeX file is composed of:
  - **preamble**
    - 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**
    - 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 commands

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 commands

- 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 commands

- Structure of Inline Commands
  `\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 commands

- 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

- 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

`\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

- 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

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

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

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 http://www.lipsum.com/)
  file: FirstDocument.tex
- Valid documentclass
  - *article*
  - *report*
  - *book*

Document anatomy according to LaTeX

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

Document anatomy according to LaTeX

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

File: document_anatomy.tex

Document anatomy

LaTeX supports several commands to organize documents into sections.

	level	book	report	article
\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

Text - paragraphs

- Put text in well-structured paragraphs (and split larger documents in parts: chapters, sections and subsections)
- 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: demo_paragraph_newlinebreak*
- *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*
- 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*


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

\section{A section}
Some text here.

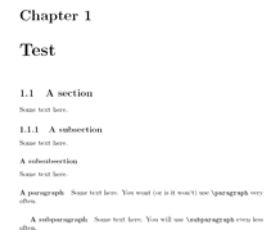
\subsection{A subsection}
Some text here.

\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}
```



- *File: demo_headings.tex*

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*

Autonumbering

- Stop autonumbering (not include chapter, section, subsection, etc. numbers in document)
  - `\section*{`*`Section Name`*`}`
  - `\chapter*{`*`Chapter Name`*`}`
- use the * to also stop other 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*

Title, author

- We can place the title and author in the preamble, then call up this information in the body. (consider it as meta data to the document)
- After the *documentclass* and *package(s)* command, enter information about the document.
  http://tex.stackexchange.com/questions/92702/should-i-place-title-author-date-in-the-preamble-or-after-begindocument
- Typically we want to include the title and author:
  - `\title{`*`Title of Document`*`}`
  - `\author{`*`Author's Name`*`}`
- Generate the title page, at the beginning of the document:
  ```
  \begin{document}
  \maketitle
  ```
  This will place the title, author, and date as a banner on the front page.

Title, author

- Date
  - 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
- It will also place the title on the header, 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}
  ```
- *File: demo_title.tex*
- If you don't like the layout this gives then you can make your own title page using the `titlepage` environment:
  ```
  \begin{titlepage}
  Title page text
  \end{titlepage}
  ```


Title, author

- See also
  - en.wikibooks.org/wiki/LaTeX/Title_Creation
  - ftp://ftp.dante.de/tex-archive/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}
```

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

Summary

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

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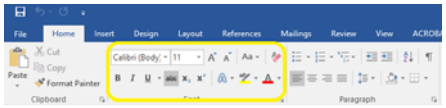
Introduction to LaTeX

Text formatting

Contents

- Emphasizing text
- Fonts etc.
- Punctuation
- Symbols etc.
- Verbatim



Highlighting text concepts

- Highlight important concepts in your text:
  - Italics
  - Bold
  - Underlined
  - Emphasis

Emphasizing text

- Use the Menu bar from your editor
- Use command:
  - Italic: `\textit`
  - Bold: `\textbf`
  - Underlining: `\underline`
- Emphasis
  - Emphasized: `\emph`
    \emph command behaves like *\textit*, but is context dependent.
- *File:demo_emphasize_text.tex*

Highlighting text

- Package: soul (+ color)

```
\hl{this is highlighted text}. More text. Can I change the color?
```

- *File: demo_highlight_text_soul.tex*

This is some text
this is highlighted text. More text. Can I change the color?

- Package: ulem
- Allows for various types of underlining
- *File: demo_ulem.tex*

~~Diesel~~, solar power to the top
~~Diesel~~, solar power to the top
Diesel, solar power to the top
Diesel, solar power to the top

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Hands-on

- `\emph{text}`: emphasized text
- `\underline{text}`: underlined text
- Change the font style:
  - `\textbf{text}`:bold:
  - `\textit{text}`:italic:
- *File: demo_fontstyle.tex*

document font family
emphasis
roman font family
sans serif font family
`typewriter font family`
upright shape
italic shape
slanted shape
SMALL CAPITALS
bold

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Font size

- The default text size is controlled by the document class. The standard font size is 10pt.
- Can be adjusted by passing additional arguments
  - `\Huge`
  - `\huge`
  - `\LARGE`
  - `\large`
  - `\normalsize`
  - `\small`
  - `\footnotesize`
  - `\scriptsize`
  - `\tiny`
- These commands change the font size relatively to the size in the document class. The commands are working like switches for font formatting
- *File: demo_fontsize.tex*

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Font size

	10pt	11pt	12pt
\tiny	5	6	6
\scriptsize	7	8	8
\footnotesize	8	9	10
\small	9	10	11
\normalsize	10	11	12
\large	12	12	14
\Large	14	14	18
\LARGE	18	18	20
\huge	20	20	25
\Huge	25	25	25

https://tex.stackexchange.com/questions/24599/what-point-pt-font-size-are-large-etc

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Font size

```
\begin{document}
This is in normal text, while these words are in
    {\small small text}.

Or, if you wanted to put a larger region in a
    different size, you'd use
something like:

    \begin{small}
    this will all be in small text
    this too.
    etc..
    \end{small}

    \begin{Huge}
    this will all be in Huge text
    this too.
    etc..
    \end{Huge}

    \begin{huge}
    this will all be in huge text
    this too.
    etc..
    \end{huge}
\end{document}
```

This is in normal text, while these words are in small text.
Or, if you wanted to put a larger region in a different size, you'd use something like:
this will all be in small text this too. etc..
this will all be in Huge text this too. etc..
this will all be in huge text this too. etc..

Fonts

- Several *variations* of a font can be used in a document
  - Family
    - Serif (roman) (default)
    - Sans serif
    - Typewriter (monospaced)
  - Series
    - Medium
    - Boldface
  - Shape
    - Upright
    - *Italic*
    - Slanted
    - Caps & small caps
- *File: demo_font_variations*

Fonts

- Font formatting can be obtained in different ways

1. **Commands**: A command marks exactly the text that is in between the curly brackets. A new paragraph cannot be started within a command.
2. **Environments**: An environment marks the text inside the environment.
   ```
   \begin{bfseries}
   ...
   \end{bfseries}
   ```

- **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 { }

Fonts

- Types of fonts in LATEX are classified into four categories: *family*, *series*, *shape* and *size*.

		Command	Environment

Family	Serif (roman) (default)
	Sans serif
	Typewriter (monospaced)
		`\textrm{}`
		`\textsf{}`
		`\texttt{}`
			`\rmfamily`
			`\sffamily`
			`\ttfamily`

Series	Medium series (default) Boldface	`\textmd{}` `\textbf{}`	`\mdseries` `\bfseries`
		Command	**Environment**

Shape	Upright shape (default)
	Italic shape
	Slanted shape
	Caps & small caps shape
		`\textup{}`
		`\textit{}`
		`\textsl{}`
		`\textsc{}`
			`\upshape`
			`\itshape`
			`\slshape`
			`\scshape`

Size	Tiny Script …	`\tiny` `\scriptsize`	

Fonts

- The default font for LaTeX is Computer Modern
- You can't just use any font you have installed on your computer, you need special LaTeX fonts.
- The easy way to use other fonts is to use an existing package,
  - `\usepackage{avant}`
  - the whole document will be in that font
- Check http://www.tug.dk/FontCatalogue/
- *File: demo_changefont.tex*

Fonts

- Change the font for part of the text (not advisable)
- To select a font, use:
  - `\fontfamily{<familyname>}\selectfont`
  - restrict the scope of font changing commands by enclosing the text in braces:
  - `{\fontfamily{<familyname>}\selectfont ...}`
  - It is important to know the font familyname!
- *File: demo_font_partly_changed.tex*
- https://tex.stackexchange.com/questions/25249/how-do-i-use-a-particular-font-for-a-small-section-of-text-in-my-document

Fonts

- https://www.overleaf.com/learn/latex/Font_sizes,_families,_and_styles
- https://www.overleaf.com/learn/latex/Font_typefaces
- https://en.wikibooks.org/wiki/LaTeX/Fonts

Accents and symbols

- There are 5 common accents:
  ÒÓÔÕÖ

```
\`O
\'O
\^O
\~O
\"O
```

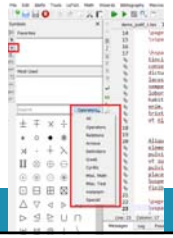
- Some symbols have a special meaning within LaTeX, put a \ in front of $ % { _ # & } \

```
\$
\%
\{
\_
\#
\&
\}
\textbackslash
```

- Check also the *Comprehensive LaTeX Symbol List*

Symbol?

- Looking for a symbol?
- Have a look at *The Comprehensive LaTeX Symbol List*
  http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf
- This document lists >14000 symbols and the corresponding LaTeX commands that produce them.
- Detexify: http://detexify.kirelabs.org/classify.html
- Check your LaTeX editor (i.e. TeXstudio)



International language support: problems

- LaTeX has its roots in USA
- Input of é, è, ë, …?
- Typing 'macro-accents':
  - it can become cumbersome if you type a lot of accented characters.
  - the spell checker will not work on such words,
- https://www.overleaf.com/learn/latex/International_language_support
- http://tex.stackexchange.com/questions/44694/fontenc-vs-inputenc
- https://en.wikibooks.org/wiki/LaTeX/Internationalization

International language support

- Input letters of national alphabets directly from the keyboard.
- Use `inputenc` package to set up input encoding.
  - `\usepackage[encoding]{inputenc}`
  - recommended input encoding is `utf8`
- for proper document generation, choose a font which has to support specific characters for a given language by using fontenc package:
  - `\usepackage[encoding]{fontenc}`
  - recommended input encoding is `T1`
- *File: demo_inputenc.tex*

babel

- translates some elements within the document,
- activates the appropriate hyphenation rules for the language you choose.
- Activate the package by adding the next command to the preamble:
  - `\usepackage[language]{babel}`
  - `\usepackage[dutch]{babel}`
- *File: demo_babel.tex*
- https://en.wikibooks.org/wiki/LaTeX/Internationalization

Hands-on

- Type some text and use the commonly used accents in some of the words
- *demo_accentsymbol.tex*
  demo_accents.tex

Preformatted text

- Use the `verbatim` environment to typeset exactly as given in a monospaced font, with no command interpretation.
- To include a non-interpreted string within your text, use `\verb|the text|` command.
  You may use |, +,=, etc. to start and end the text (the same symbol must be used to start and end the text).
- *File: demo_verbatim.tex*
- The verbatim environment can be extended to use normal commands: alltt package.

Hands-on

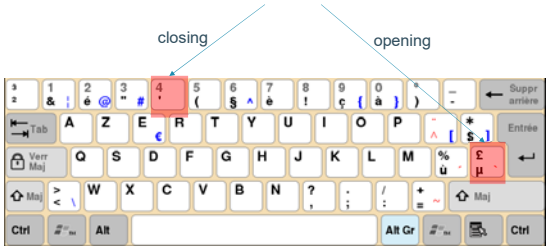
- Generate some text, and try to explicitely print some LaTeX commands
- Use the `\verb` command
- Use the `verbatim` environment
- *handson_verbatim.tex*

Quotation marks

- LaTeX does not automatically convert "straight" quotes into correctly-facing “curly” quotes
- do *not* use the "
  - Opening: use two ` (accent grave)
  - Closing: use two ' (vertical quote) for closing quotation marks.
  - For single quotes you use just one of each.
- *File: demo_quote_marks.tex*
- https://tex.stackexchange.com/questions/113363/smart-quote-in-texstudio
- https://www.overleaf.com/learn/latex/Typesetting_quotations

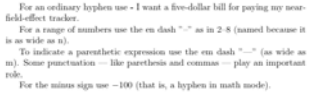
Quotation marks

- Options->Configure TexStudio -> Editor ->Replace Double Quotes



Hyphens and dashes etc.

- hyphens (-), en dashes (–), em dashes (—), minus signs (-) serve different purposes
- *File: demo_hyphen_dash.tex*


For an ordinary hyphen use - I want a five-dollar bill for paying my near-field-effect tracker.
For a range of numbers use the en dash "–" as in 2–8 (named because it is as wide as n).
To indicate a parenthetic expression use the em dash "—" (as wide as m). Some punctuation — like parethesis and commas — play an important role.
For the minus sign use −100 (that is, a hyphen in math mode).

- Ellipsis
  - Spacing might go wrong when typing …
  - Use `\ldots`

Overfull / Underfull box

- **overfull hbox**: LaTeX always tries to produce the best line breaks possible. If it cannot find a way to break the lines in a manner that meets its high standards, it lets one line stick out on the right of the paragraph.
- This happens most often when:
  - a suitable place to hyphenate a word is not found.
  - Verbatim
- Tip: use option draft in documentclass (black square)
- Instruct LaTeX to lower its standards
  - `\sloppy` command.
    increasing the inter-word spacing, most of the time a warning ("underfull hbox") will appear
  - `\fussy` brings LaTeX back to its default behavior.
  - *File: demo_sloppyfussy.tex*

hyphenation

- Direct the hyphenation yourself
  - `\hyphenation{FORTRAN Hy-phen-a-tion}`
  - each hyphenation point is indicated
  - in the preamble
- Inline words: `\-` indicates hyphenation points allowed in the word.
  - is especially useful for words containing special characters
  - `su\-per\-cal\-i\-frag\-i\-lis\-tic\-ex\-pi\-al\-i\-do\-cious`
- *File: demo_hyphenate.tex*

Keeping words together

- The command `\mbox{`*`text`*`}`causes its argument to be kept together: an invisible box is drawn a just wide enough to hold the text created by its argument.
- The command `\fbox` is similar to `\mbox`, but in addition there will be a visible box drawn around the content.
- `\makebox, \framebox` are extensions of these commands

```
\makebox[width][pos]{text}
```

- *File: demo_mbox.tex*
- Non-breaking space: use the character ~.
  For example to stop LaTeX from splitting P. Harwin after the P., type `P.~Harwin`.

White space

- LaTeX ignores whitespace after commands. If you want to get a space after a command, you have to put {}. The {} stops LaTeX from eating up all the space after the command name.

```
I read that Knuth divides the
people working with \TeX{} into
\TeX{}nicians and \TeX perts.\\
Today is \today.
```

I read that Knuth divides the people working with TEX into TEXnicians and TEXperts.
Today is September 27, 2005.

- *File: demo_space_2.tex*

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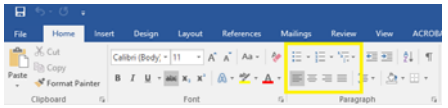
Introduction to LaTeX

text layout

Contents

- Alignment
- Lists
- Columns etc.



Text alignment

- Default: LaTeX justifies text.
- Encapsulate the text to align in an environment
  - left (`flushleft`): left align
  - center (`center`): center
  - right (`flushright`): right align
  - Create an additional spacing between the paragraphs
- *File: demo_justif_1.tex*

Text alignment

- Use switch commands `raggedright, raggedleft, centering`
- `\raggedright` will produce left-aligned text, but the behaviour is different; in this case the text will be left-aligned from the point where the command is declared till another switch command is used. This is more suitable to align long blocks of text or the whole document.
- *File: demo_justif_2.tex*
- LaTeX default text alignment is fully-justified, but often left-justified text may be a more suitable format. This left-alignment can be easily accomplished by importing the ragged2e package
- *File: demo_ragged2e.tex*

Hands-on

- Use *handson_justif.tex*
- Play around with the justification options and check the result.

Lists

- Different possiblities to make a list in LaTeX:
  - unnumbered list.
  - numbered items.
  - A list with labeled items.
- The corresponding environments are:
  - `itemize`
  - `enumerate`
  - `description`
- Lists can be nested (up to 4 levels)

itemize

- ```
  \begin{itemize}
  \item …
  \end{itemize}
  ```
- Each entry must be preceded by the control sequence `\item`.
- Can be nested (4 levels)
- Bullets can be changed for each level using the following command:
- ```
  \renewcommand{\labelitemi}{$\bullet$}
  \renewcommand{\labelitemii}{$\cdot$}
  \renewcommand{\labelitemiii}{$\diamond$}
  \renewcommand{\labelitemiv}{$\ast$}
  ```
- *File: demo_itemize.tex*

enumerate

- ```
  \begin{enumerate}
  \item …
  \end{enumerate}
  ```
- *File: demo_enumerate.tex*
- Changing the format of the numbering can be done with the the enumerate package or enumitem
- ```
  \usepackage{enumerate}
  …
  \begin{enumerate}[I]%for capital roman numbers.
  \item
  \end{enumerate}
  \begin{enumerate}[(a)]%for small alpha-characters within brackets.
  \item
  \end{enumerate}
  ```
- *File: demo_enumerate_2.tex*

description

- `\begin{description}`
  `\item[] …`
  `\end{description}`
- Very handy when explaining notations or terms.
- ```
  \begin{description}
  \item[Cost] Freeware.
  \item[Implementation] Easy: download the executable and
  click on it.
  \item[Maintenance] None.
  \end{description}
  ```
- *File: demo_description.tex*

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Hands-on

- Generate some text, and use the different list commands:
  - itemize
  - enumerate
  - description
- Try to build a nested list
- *File: handson_lists.tex*

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Fills and spaces

- `\hspace{width}`: Creates a horizontal white space with the chosen width; has no effect at the end of the line
- `\hspace*{width}`: Creates a horizontal white space with the chosen width; even 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
- *File: demo_space_1.tex*

Fills and spaces

- `\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)
- Other commands to insert vertical blank spaces
  - `\smallskip`
  - `\medskip`
  - `\bigskip`
- *File: demo_space_3.tex*
  ```

Columns

- use `twocolumn` option to your document class, which splits everything in two
- Package multicol: flexible tool to handle multicolumn documents
- Environment: enclosed inside the tags `\begin{multicols}` and `\end{multicols}`
- Parameters:
  - Number of columns
  - Header text, in between []. This is optional and will be displayed on top of the multicolumn text.
- *File:column_layout.tex*
- See also: https://www.overleaf.com/learn/latex/Multiple_columns

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Introduction to LaTeX

mathematics

Contents

Math mode

- Inside a document:
  - text is set in *text mode*.
  - formulas are typeset in *math mode*.
    - Uses math italic font
    - Uses different spacing, ignoring all but explicit spaces
- Math typesetting includes:
  - mathematical expressions and formulas:
    - digits, variables, operations and operators, mathematical symbols,
    - names of mathematical functions;
  - superscribing or subscribing of text;
  - Greek letters;
  - various special characters/symbols.

AMS-math

- LaTeX provides a very large number of math symbols.
- The amsmath package, (American Mathematical Society) adds to LaTeX extra features related to math typesetting.
  - Advisable to use this package when a lot of mathematics are in your document.
    `\usepackage{amsmath}`
- http://en.wikibooks.org/wiki/LaTeX/Mathematics

equations

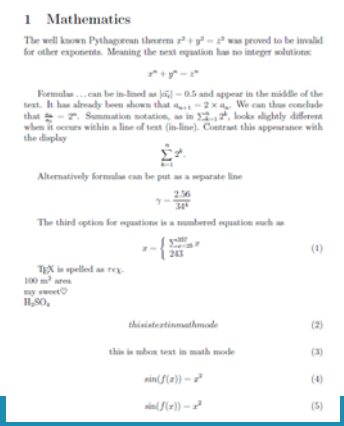
- Equations can be included in 2 ways:
  - in-line mode (within a text paragraph):
    - delineated by `$ $`
    - delineated by `\(  \)`
    - delineated by `\begin{math}  \end{math}`
  - Display mode: will be centered and in their own line of text.
    - Unnumbered `\[ \]`
    - Unnumbered `\begin{displaymath} \end{displaymath}`
    - Unnumbered `$$  $$`
    - Numbered `\begin{equation}  \end{equation}`
- *File: demo_math_equation.tex*


```
%demo_math01
Formulas can be in-lined as
$\vec{\alpha_{i}} | = 0.5$ and
appear
in the middle of the text. It has
already been shown that $a_{n+1} = 2
\times a_n$. We can thus conclude
that $\frac{a_n}{a_0} = 2^n$.
Summation notation, as in
$\sum_{k=1}^n 2^k$, looks
slightly different when it occurs
within a line of text (in-line).
Contrast this appearance with the
display
\[
\sum_{k=1}^n 2^k.
\]

Alternatively formulas can be put
as a separate line
\[ \gamma = \frac{2.56}{34^{4}} \]

The third option for equations is a
numbered equation such as

\begin{equation}
x = \left\{ \begin{array}{l}
\sum_{x=25}^{357} x \\
                                243
\end{array} \right.
\end{equation}
```



1 Mathematics

The well known Pythagorean theorem $x^2 + y^2 = z^2$ was proved to be invalid for other exponents. Meaning the next equation has no integer solutions:

$$x^n + y^n = z^n$$

Formulas ... can be in-lined as $|\vec{\alpha_i}| = 0.5$ and appear in the middle of the text. It has already been shown that $a_{n+1} = 2 \times a_n$. We can thus conclude that $\frac{a_n}{a_0} = 2^n$. Summation notation, as in $\sum_{k=1}^n 2^k$, looks slightly different when it occurs within a line of text (in-line). Contrast this appearance with the display

$$\sum_{k=1}^{n} 2^k.$$

Alternatively formulas can be put as a separate line

$$\gamma = \frac{2.56}{34^{4}}$$

The third option for equations is a numbered equation such as

$$x = \left\{ \begin{array}{l} \sum_{x=25}^{357} x \\ 243 \end{array} \right. \quad (1)$$

TEX is spelled as $\tau\epsilon\chi$.
100 m^2 area
my sweet♡
H_2SO_4

$$this is text in math mode \quad (2)$$

$$\text{this is mbox text in math mode} \quad (3)$$

$$sin(f(x)) - x^2 \quad (4)$$

$$sin(f(x)) - x^2 \quad (5)$$

Building blocks of a formula

- Arithmetic
- Delimiters
- Binomial coefficients
- Ellipses
- Operators
- Text
- Math accents
- Matrices

Based on: Practical LaTeX, by George Grätzer

Arithmetics

- Write the operators in a natural way
  - `+ - /`
  - For multiplication use `\cdot` or `\times`
- Fractions use \frac
  - `$\frac{numerator}{denominator}$,`
- Subscripts and superscripts:
  - Carets (^) indicate superscripts, `$X^2$`
  - Underscores (_) indicate subscripts, `$X_1$.`
  - When the sub/superscript contains more than one character, it is enclosed in braces, `$X^{n+1}$.`
- *File: demo_math_arithmetics*

Binomial, Delimiter

- Binomial coefficients are typeset with the `\binom` command
  `\binom{a}{b + c}`
- Brackets around a tall object in math mode do not look right with normal sized brackets:
  `\[(\frac{1}{1 + x})\]`
- Use the command to resize dynamically
  `\left`*`Delimiter`* `\right`*`Delimiter`*

  $(\frac{1}{1+x})$

  `\[\left(\frac{1}{1+x}\right)\]`

  $\left(\frac{1}{1+x}\right)$

Invisible delimiter

- Use `\right.` or `\left.` for an invisible delimiter

```
\[
f(x) = \left\{
\begin{array}{cl}
0 & x \leq 0 \\
1 & x > 0
\end{array}
\right.
\]
```

$$f(x) = \begin{cases} 0 & x \leq 0 \\ 1 & x > 0 \end{cases}$$

Controlling size of the brackets

- Control the size of the brackets manually:
  - `\big`
  - `\Big`
  - `\bigg`
  - `\Bigg`
- *File: demo_math_delimiter.tex*

Integrals, operators

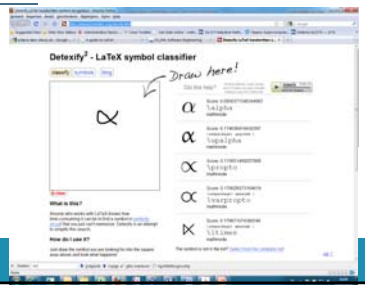
- Sums and integrals:
  - Sum: `\sum` (different from the \Sigma symbol).
  - Product: `\prod`
  - Integrals: `\int`
  - Size is adjusted automatically according to the equation
  - Lower and upper limits are specified as subscripts and superscripts:
- Limits:
  - `\lim` produces the “lim” symbol
- *File: demo_math_calculus.tex*

Text and math accents

- Math Text:
  - Text in math mode is in italics
  - This can be avoided for certain functions by typing the following: `\sin, \cos, \log, \ln, \exp`, etc.
  - Other text within equations is specified with an `\mbox` or `\text` (`amsmath`)command (this command also keeps text together)
- Math accents
  - `$\bar{a}$`
  - `$\hat{a}$`
  - `$\tilde{a}$`
  - `$\vec{a}$`
- *File: demo_math_text.tex*

Symbols

- Check http://www.ctan.org/tex-archive/info/symbols/comprehensive/
- Use detexify http://detexify.kirelabs.org/classify.html



Some Mathematical Symbols

$\aleph$	`\aleph`	$\prime$	`\prime`	$\forall$	`\forall`
$\hbar$	`\hbar`	$\emptyset$	`\emptyset`	$\exists$	`\exists`
$\imath$	`\imath`	∇	`\nabla`	$\neg$	`\neg`
$\jmath$	`\jmath`	$\surd$	`\surd`	$\flat$	`\flat`
ℓ	`\ell`	$\top$	`\top`	$\natural$	`\natural`
$\wp$	`\wp`	$\bot$	`\bot`	$\sharp$	`\sharp`
$\Re$	`\Re`	$\|$	`|`	$\clubsuit$	`\clubsuit`
$\Im$	`\Im`	$\angle$	`\angle`	$\diamondsuit$	`\diamondsuit`
∂	`\partial`	$\triangle$	`\triangle`	$\heartsuit$	`\heartsuit`
∞	`\infty`	$\backslash$	`\backslash`	$\spadesuit$	`\spadesuit`

Greek Letters

α	`\alpha`	ι	`\iota`	ρ	`\rho`
β	`\beta`	κ	`\kappa`	σ	`\sigma`
γ	`\gamma`	λ	`\lambda`	τ	`\tau`
δ	`\delta`	μ	`\mu`	υ	`\upsilon`
ϵ	`\epsilon`	ν	`\nu`	ϕ	`\phi`
ζ	`\zeta`	ξ	`\xi`	χ	`\chi`
η	`\eta`	o	`o`	ψ	`\psi`
θ	`\theta`	π	`\pi`	ω	`\omega`

ϵ	`\epsilon`	ε	`\varepsilon`
θ	`\theta`	ϑ	`\vartheta`
π	`\pi`	ϖ	`\varpi`
ρ	`\rho`	ϱ	`\varrho`
σ	`\sigma`	ς	`\varsigma`
ϕ	`\phi`	φ	`\varphi`

Hands-on

$$\frac{\sqrt{2+z^2}}{\sqrt[3]{a}+5}$$

$\alpha, \beta, \Gamma, \epsilon, \varepsilon, \tau$

$\exp(i\theta) = \cos\theta + i\sin\theta$

$$\lim_{\theta\to\pi}\sum_{i=1}^{n}\theta^i\sin\theta$$

$\lim_{b\to\infty}\int_a^b f(x)$

$$\lim_{b\to\infty}\int_a^b f(x)$$

$$\left(\frac{1}{1+x}\right)$$

Write a file (math_handson_1.tex) expressing the above mathematical formulas.

Matrices / arrays

- The most basic way to create matrices is by entering the matrix environment while in math mode.(amsmath needed)

```
\[
\begin{matrix}
a & b & c\\
d & e & f\\
g & h & i
\end{matrix}
\]
```

- & symbols will align, and \\ will drop to the next line
- `pmatrix and bmatrix` will put parentheses
- *File: demo_math_matrix.tex*

Matrices / arrays

- typeset arrays use `array` environment (default LaTeX environment)
- Similar to `matrix` environment, offers some control (cfr text tables)
  - Specify alignment
  - `l` align to the left, `c` align each to the center, and `r` align to the right
  - use delimiters to get brackets
- *File: demo_math_array.tex*

```
\[ \begin{array}{cc}
0 & 1\\
2 & 3
\end{array}
\]
```


Matrices / arrays

- Dots in an array:
  - `\ldots`: horizontal
  - `\vdots`: vertical
  - `\ddots`: diagonal

$$\mathbf{X} = \begin{pmatrix} x_{11} & x_{12} & \cdots \\ x_{21} & x_{22} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

Aligning equations

- The *amsmath* package provides options for displaying equations
- Split an equation
  - In the `split` environment
- For equations longer than a line use the `multline` environment. Insert \\ to set the break.
- Align several equations vertically, with the `align` environment
- *File: demo_math_aligneqn.tex*

- Based on https://www.sharelatex.com/learn/Aligning%20equations%20with%20amsmath

- https://en.wikibooks.org/wiki/LaTeX/Advanced_Mathematics#Other_environments

multline	First line is left-aligned, last line is right-aligned, all others are centered.
gather	Each line is centered.
align	Use & to mark a symbol where the formulas shall be aligned.
split	Similar to align, but within another math environment, thus unnumbered

Math spacing

- Commands to adjust spacing between symbols in a formula

- Based on https://www.sharelatex.com/learn/Spacing_in_math_mode

LATEX code	Description
\quad	space equal to size of a capital M (= 18 mu)
\,	3/18 of \quad (= 3 mu)
\:	4/18 of \quad (= 4 mu)
\;	5/18 of \quad (= 5 mu)
\!	-3/18 of \quad (= -3 mu)
\ (space after backslash!)	equivalent of space in normal text
\qquad	twice of \quad (= 36 mu)

Equations on web

- Check:
  - https://www.latex4technics.com/
  - http://equplus.net/
  - http://rogercortesi.com/eqn/index.php
  - http://www.tlhiv.org/ltxpreview/
  - http://www.codecogs.com/latex/eqneditor.php?lang=en-en
  - http://www.sciweavers.org/free-online-latex-equation-editor

Tips

- No blank lines are permitted in a formula.
- LaTeX ignores spaces in math

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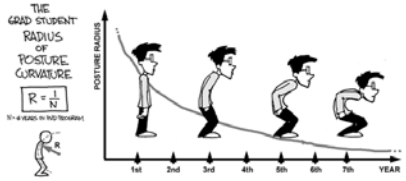
Introduction to LaTeX

adding images, tables, ...

Contents



Images

- Inserting images
- Create graphics using Inkscape, GIMP, Corel, . . .
- Additional package needed: `graphicx` package provides commands to include images
- Images behave quite similar to characters, just in larger boxes
- https://en.wikibooks.org/wiki/LaTeX/Importing_Graphics
- https://www.overleaf.com/learn/latex/Inserting_Images

Images

- Which formats can be handled mainly depends on dvi processor:
  - PS output: eps, (jpeg);
  - PDF output: png, jpeg, pdf, eps (pdflatex)
- **Compiling with *latex***
  - The only format you can include while compiling with *latex* is **EPS**.
- **Compiling with *pdflatex***
  - If you are compiling with pdflatex to get a PDF, you have a wider choice. You can insert
  - **JPG**, widely used on Internet, digital cameras, etc.
  - **PNG**, very common format (even if not as much as JPG)
  - **PDF**, it is widely used for documents but can be used to store images as well.
  - **EPS**

Images

- Include graphics file (as box):
  `\includegraphics[options]{filename}`
- where options is a comma separated list of:
  - `angle=x` rotate picture by x
  - `width=len` scale picture to width len
  - `height=len` scale picture to height len
  - `scale=x` scale picture
  - `draft` don't display image, just draw bounding box with filename inside
- *File: demo_includegraphics_01.tex*
- *File: demo_includegraphics_02.tex*

Images

```
% playing around with the options

Changing both height and width is not always
   a good idea
\includegraphics[height=3cm,width=5cm]{figure
   s/tux.pdf}

\includegraphics[width=0.5\linewidth]{figures
   /tux.pdf}

Turning it around
\includegraphics[angle=-
   30,width=5cm]{figures/tux.pdf}
\includegraphics[angle=-
   60,width=5cm]{figures/tux.pdf}
\includegraphics[angle=-
   90,width=5cm]{figures/tux.pdf}
Scaling it
\includegraphics[scale=0.30]{figures/tux.pdf}
Draft, show no picture, only the bounding box
\includegraphics[draft,
   scale=0.25]{figures/tux.pdf}
```

Turning it around

Location of images

- Tell LaTeX where to look for images
- Images can be stored centrally for use in many different documents.
- `\graphicspath` : provide an additional directory path to search for images (relative path)
- `\graphicspath{{/var/lib/images/}} \graphicspath{{./images/}} \graphicspath{{images_folder/}{other_folder/}{third_folder/}}`
- Or specify absolute path
  `\includegraphics{D:/Cursus_Final/Latex/examples/Basics-3/figures/atomium.jpg}`
- *File: demo_includegraphics_03.tex*

Hands-on

- Use the file demo_includegraphics_01 and change the options, check the result.
- Use google images, to search for some pictures to enclose.

Tables

- environment, designed for formatting data into nicely arranged tables.
  - `tabular` in text modus
  - `array` in mathematical mode
- A tabular environment creates a table that LaTeX treats as a “large symbol”. A table cannot be broken across pages.
- LaTeX determines the width of the columns automatically.
- https://en.wikibooks.org/wiki/LaTeX/Tables
- https://www.latex-tutorial.com/tutorials/tables/

Tabular

```
\begin{tabular}[pos]{cols}
column 1 entry & column 2 entry ... & column n entry \\
... ...
\end{tabular}
```

File: demo_tabular_basic.tex

```
\begin{tabular}{l|r}
Track (100 m): & 25 sec \\
Swim (50 m): & 10 min \\
Bike (1 km): & 5 min \\
\end{tabular}
```

Track (100 m):	25 sec
Swim (50 m):	10 min
Bike (1 km):	5 min

Tabular

- Arguments to describe the table columns:
  - & column separator
  - \\ start new row
  - `\hline` horizontal line

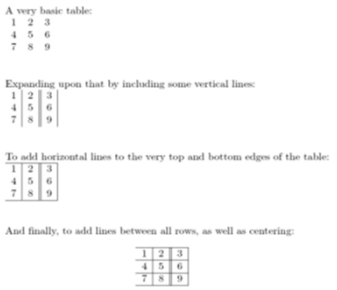
`l`	left-justified column
`c`	centered column
`r`	right-justified column
`p{'width'}`	paragraph column with text vertically aligned at the top
`m{'width'}`	paragraph column with text vertically aligned in the middle (requires array package)
`b{'width'}`	paragraph column with text vertically aligned at the bottom (requires array package)
`|`	vertical line
`||`	double vertical line

Row format

- A row of a tabular is separated into columns by & (alignment character)
- A row end is indicated by \\
- Rows may contain less, but not more columns than specified by tabular argument
- Width of a column is determined by the width of the largest cell

Hands-on

- Write a file, building these simple tables. (*handson_tabular_01.tex*)


A very basic table:

1	2	3
4	5	6
7	8	9

Expanding upon that by including some vertical lines:

1	2	3
4	5	6
7	8	9

To add horizontal lines to the very top and bottom edges of the table:

1	2	3
4	5	6
7	8	9

And finally, to add lines between all rows, as well as centering:

1	2	3
4	5	6
7	8	9

Combining rows and columns

- Columns can be combined in a bigger cell:
  `\multicolumn{cols}{pos}{text}`
  - Combines the next cols to single column with alignment pos and contents text
  - Must be at the beginning of a row or directly after &
- To combine rows: package multirow
- *File: demo_tabular_multi.tex*

Horizontal, vertical lines

- Vertical lines are marked by | in column specification
- Horizontal lines are inserted with `\hline`
- A horizontal line from column x to y:
  `\cline{x-y}`
- A vertical line, over the height of a cell
  `\vline`
- *File: demo_tabular_more.tex*

Limiting width

- `p{width}`
- defines a paragraph column with the specified *width*

- More power with packages:
- Package tabularx
- \begin{tabularx}{*width*}[*position*]{*column form*}
  Table data
  \end{tabularx}
- Package array: m-parameter

- *File: demo_tabular_limit.tex*

```
\begin{tabular}{|l c
  p{90mm} |}
\hline
Column 1 & Column 2 &
  Column 3\\
\hline\hline
Lorem Ipsum & 1 &  Lorem
  ipsum dolor sit amet,
  consectetuer adipiscing
  elit. Vivamus dictum
  tortor pellentesque dui.
  Vivamus dui. Mauris
  feugiat vehicula turpis.
  Etiam convallis metus ut
  odio adipiscing
  malesuada. Quisque et
  ante. Aliquam molestie.
```

Column 1	Column 2	
Lorem Ipsum	1	
Lorem Ipsum	2	Phasellus blandit est. Maecenas odio neque, euismod in, hend

Column 1	Column 2	Column 3
Lorem Ipsum	1	Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Vivamus dictum tortor pellentesque dui. Vivamus dui. Mauris feugiat vehicula turpis. Etiam convallis metus ut odio adipiscing malesuada. Quisque et ante. Aliquam molestie. Nulla facilisi. Pellentesque quis purus. Mauris a augue. Donec elit ligula, feugiat quis, dignissim vitae, nonummy ac, elit. Nunc eu augue. Morbi laoreet, velit id lobortis congue, eros libero tincidunt nisi, nec interdum nibh dui et nulla. Aliquam faucibus, nisl quis bibendum iaculis, tellus augue tempus nulla, quis gravida leo orci eu quam. Suspendisse felis. Ut id nunc.
Lorem Ipsum	2	Phasellus blandit est. Maecenas odio neque, euismod in, hendrerit ut, ultrices sed, odio. Vivamus iaculis lectus non arcu. Suspendisse laoreet, felis sed malesuada fermentum, libero sem feugiat quam, et porta libero justo id dolor. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Vivamus posuere. Duis

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Guidelines for Making Tables

- Taken from: Markus Püschel https://www.inf.ethz.ch/personal/markusp/teaching/guides/guide-tables.pdf

- Avoid vertical lines
- Avoid “boxing up” cells, usually 3 horizontal lines are enough: above, below, and after heading
- Avoid double horizontal lines
- Enough space between rows
- If in doubt, align left

- Use booktabs (http://texdoc.net/texmf-dist/doc/latex/booktabs/booktabs.pdf)

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Multipage tables

- If the table is longer than one page, then package `longtable` should be used.
- tables that can be broken by the standard LaTeX page-breaking algorithm. There are four elements parameters to set
- *File: demo_tabular_longtable.tex*
- To create a table in landscape mode, the `rotating` package is needed.
- The table is produced using

```
\begin{sidewaystable}

\end{sidewaystable}
```

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Tables from excel

- LaTeX code to generate tables can be cryptic at first.
  - use software to write this code
  - create tables in Excel and export them to LaTeX.
- Excel tables can be converted using:
  - excel2latex (https://www.ctan.org/tex-archive/support/excel2latex/)
    tested: works with Office 2013
  - LaTable (www.ctan.org/tex-archive/help/Catalogue/entries/latable.html)
    - ? recent
- Note:
  - Some features will not be supported
  - Extra editing can be needed
  - It will help to understand how the "table" commands work.

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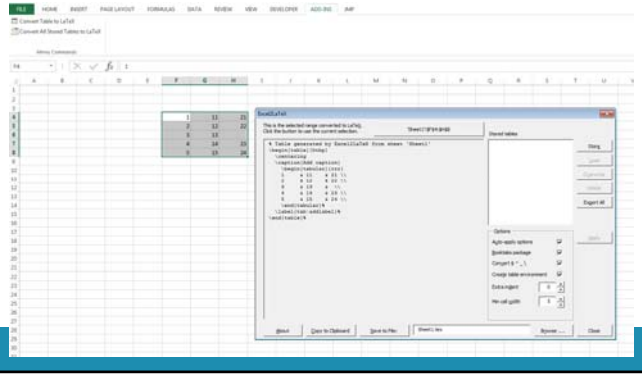
excel2latex

- Office 2013



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Webtool

- http://www.tablesgenerator.com/
- Create the table in your browser, copy the code into your LaTeX document
- http://ericwood.org/excel2latex/

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Matlab

- Convert matrices, cells or MATLAB tables to LaTeX table code.
- Check matlab central file exchange
  http://www.mathworks.com/matlabcentral/fileexchange/
- latexTable

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Floats

- LaTeX breaks paragraphs and sentences across pages to avoid partially filled pages.
- Problem: table or image is to large to be placed on the page
  - Pictures and tables, cannot be split;
  - *floated* to convenient places, such as the top of the following page
  - Get a minimum on whitespace
- Floats: Objects, depending on the space available, will be placed where they are invoked or further on in the text.
- http://en.wikibooks.org/wiki/LaTeX/Floats,_Figures_and_Captions

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Floats

- Works for images and tables: `table` and `figure` are two of the environments provided by LaTeX
- floats may become a major source of frustration, when LaTeX does not put them where you want them to be.
- *File: demo_float_01.tex*

Floats

- Any material enclosed in a figure or table environment will be treated as floating matter.
- `\begin{figure}[`*`placement specifier`*`]` or `\begin{table}[. . . ]`
- *placement specifier*. parameter used to indicate the locations to which the float is allowed to be moved.
  - **h (*Here)***: at the very place in the text where it occurred.This is useful mainly for small floats.
  - **t (*Top)***: at the *top* of a page.
  - **b(*Bottom)***: at the *bottom* of a page
  - **p(*Page of floats)***: on a special *page* containing only floats.
  - **!** ***Force!*** (does not work with p)

Rules

- Floating objects will not appear prior to the page where they are referred on
- If floating objects can not be placed, they will appear at the end of the document.
- `\clearpage` can force the pending objects to be placed

caption

- It is always good practice to add a caption to any figure or table. `\caption[`*`shortform`*`]{text}`
- Place caption on top or at the bottom
- Needs to be in a table or figure environment
- Automatic numbering:
  - Table nr:
  - Figure nr:
- The shortform will be used in the list of figures, list of tables.
- *File: demo_caption_01*

Hands-on

- Use *demo_float_01* and change the placement specifier, check the resulting output
- Use *demo_float_02*
  - Compile the text and check the list of tables and the list of figures.
  - Change the placement specifier, check the resulting output

More with tables

- Put color in tables
  - Package `colortbl` with additions of `xcolor` (when used, load this package as last).
    http://tex.stackexchange.com/questions/5363/how-to-create-alternating-rows-in-a-table
  - *File: demo_colortable.tex*
- Package `wrapfig`
  - Allows text to be wrapped around a table
  - *File: demo_wraptable.tex*

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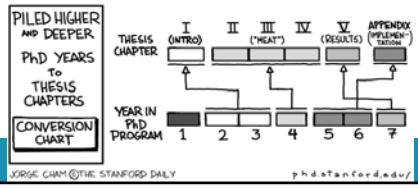
Introduction to LaTeX

Large documents

Contents

- Large documents
- Referencing
- Index
- Glossaries
- Hyperlinks
- In the margin



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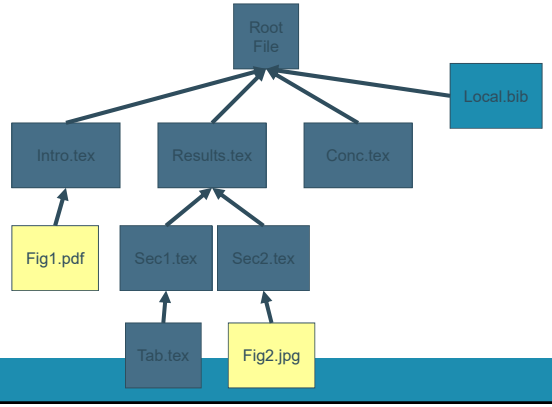
Large documents: structure



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Large documents

- Large document: keeping all the source text in one file becomes unmanageable.
- Advantages to break a document into separate files:
  - Imposes a structure on the document as a whole.
  - Allows you to focus on each part separately.
  - Maintenance of the document becomes easier,
  - (Pre)view only part of the document.
- https://tex.stackexchange.com/questions/22431/everyday-latex-and-workflow/22433#22433

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Project structure

- Get some folder structure
  - create a directory for the project.
  - create two folders:
    - /tex: for the LaTeX files
    - /img: for the images
- create the root document in the root folder
  - ./MyRootDoc.tex
  - ./tex/
  - ./img/
- https://en.wikibooks.org/wiki/LaTeX/Modular_Documents

Large documents

```
\documentclass[a4paper]{book}
\title{A Thesis}
\author{MY Self}
\begin{document}
  \frontmatter
    \maketitle
    \tableofcontents
    \listoffigures
    \listoftables
  \mainmatter
    \include{introduction}
    \include{background}
    \include{methodology}
    \include{implementation}
    \include{analysis}
    \include{discussion}
    \include{conclusion}
  \appendix
\include{sourcecode}
  \backmatter
    \bibliography{bibthings}
\end{document}
```

- A typical root document

Large documents

- LaTeX supports splitting a document in several files. Two commands will make it easy:
  - `\input{file.tex}`
  - `\include{file.tex}`
- Both commands allow to include content from external files inside another LaTeX document. The idea is that you have some top level document file and a number of files that get included in this file automatically when you run LaTeX.

\input

- `\input`
  - Easy to use: segment the text into chunks, run LaTeX on the top-level file, the contents of each chunk will be read in at the specified points as if its contents have been typed at that point.
- Top-level

```
\documentclass{...}
...
\begin{document}
\input{firstfile}
\input{secondfile}
...
\input{lastfile}
\end{document}
```

\input

- The name of each included file must have the .tex extension
- `\input` can be nested
  firstfile can contain calls to other files to input.
- Each inputted file is not a standalone LaTeX file (no `\documentclass{...}, \begin{document} \end{document}`).
- calls to input can be mixed with other arbitrary text and LaTeX commands.
- *File: MyLargeBook-input.tex*

\input

- Limitations when using not all the input files
  - If you want to focus only on some parts of the text and you delete or put in comment the *\inputs* you don't want, the numbering of sections, page numbers will only rely on the parts that are included.
  - Cross-references will not be resolved.
- Typical use:
  - *Swap out* the preamble
    - put the preamble commands in a separate file and re-use it
  - Keep stuff like tikz figures, complex tables, etc. in separate files

\include

- `\include` works in a similar way as `\input` but there are some differences:
- `\include` implicitly starts new pages. `\include{filename}` behaves like:

```
\clearpage
\input{filename}
\clearpage
```

- Useful for page ranges such as chapters or sections.
- Cannot be nested.
- Can only appear in the *document* body
- Supports a mechanism of choosing which parts of the document you wish to compile (`\includeonly`).

\include

- Top-level (same as with \input)

```
\documentstyle{...}
...
\begin{document}
\include{firstfile}
\include{secondfile}
...
\include{lastfile}
\end{document}
```

\include

- Each included file gets its own .aux file.
- LaTeX looks at the other aux files, it knows about section and page numbers, cross-references,…
- Each included file will automatically begin on a new page,
- `\includeonly` controls which files will be read by LaTeX
  - multiple files specified in the `\includeonly` line, have to be separated by commas with no intervening spaces.
  - can only appear in the preamble.
- *File: MyLargeBook-include.tex*
- *File: MyLargeBook-includeonly.tex*

\include vs \input

- `\include{blah}` starts a new page and inserts the file blah.tex while `\input{blah}` simply inserts blah.tex.
- use `\include` only for top-level items like chapters where you want to start a new page.
- `\input` simply drops in a block of LaTeX code as-is.
  It can be useful for inserting tables which are machine-generated.
- `\input` can be nested, `\include` not.

	\input	\include
Nesting allowed	X	
Start new page		X
Suited for chapter subfiles		X
Suited for any subfile	X	

Hands-on

- Use handson_large_01 and the subfiles handson-large1, handson-large2, handson-large3
  - Compile the text
  - check the result.
- Split handson-large2 into smaller subfiles and check the result
- Use `\include` instead of \input
- Use `\includeonly` to compile only a part of the text

\import

- In some cases `\input` and `\include` can cause trouble if nested file importing is needed. `\input` needs the full filename starting from the working directory
- https://danielsank.github.io/tex_modularity/
- https://tex.stackexchange.com/questions/58465/how-to-use-the-import-package
- Package import
  - `\usepackage{import}`
  - Specify the folder and the file. `\import{ }{ }`. The first parameter inside braces is the directory where the file is located, it can be relative to the current working directory or absolute. The second parameter is the name of the file to be imported
  - `\import{sections/}{section1-1.tex}`
  - Just replace `\input{dir/file}` with `\subimport*{dir}{file}`and all LaTeX code will handle relative paths properly.

Modularity

- A disadvantage of solely using \input and \include is that only the base document can be compiled.
- Working on individual sections of text and editing and compiling those separate from the main file is possible with the packages:
  - subfiles
  - standalone
- https://en.wikibooks.org/wiki/LaTeX/Modular_Documents
- https://jonasdevlieghere.com/modular-latex-with-subfiles/
- https://texfaq.org/FAQ-multidoc
- https://www.overleaf.com/learn/latex/Multi-file_LaTeX_projects

Referencing

- Reference almost anything that is numbered (sections, figures, formulas)
- LaTeX will take care of numbering, updating it whenever necessary.
- `\label{`*`marker`*`}` give the object a *marker*
- `\ref{`*`marker`*`}` reference the object you have *marked*
- `\pageref{`*`marker`*`}` It will print the number of the page where the object is.

Labels

- Common practice to structure the labels
  - **chap:** chapter
  - **sec:** section
  - **fig:** figure
  - **tab:** table
  - **eq:** equation

  `\label{fig:`*`my_figure`*`}`

  File: demo_label

Labels and references

- References to equations and sections.
- Label the item
  - `\section{...} \label{sec:sec-name}`
  - `\begin{equation} ... \label{eq:eq-name} \end{equation}`
- Having created the labels, refer to the objects using `\ref{label-name}`
- Works also for chapters, subsections, subsubsections, tables, figures, and enumerated lists.
- Run the compilation several times
- *File: demo_referencing_01*

Label and floats

- Use the `\label` command to cross-reference:

```
\begin{figure}
\includegraphics{. . . }
\caption{This is Donald}
\label{Donald}
\end{figure}
```

- *Warning:* If you want to label a figure so that you can reference it later, you have to add the label **after the caption** but **inside the floating environment**. If it is declared outside, it will give the section number.

Hyperlinks

- `\usepackage{hyperref}`
- Importing the `hyperref` package all cross-referenced elements become hyperlinked.
- Be careful when importing `hyperref`. Usually it has to be the last package to be imported.
- https://www.overleaf.com/learn/latex/Hyperlinks

Hyperref: setting parameters

- Use hypersetup (in preamble) to set some parameters
- Every parameter must be comma-separated and the syntax must be in the format parameter=value.
- `\hypersetup` : specify parameters
  - `colorlinks=true`
    - Links will be colored (default red).
  - `linkcolor=blue`
    - Internal links, those generated by cross-referenced elements, are displayed in blue.
  - `filecolor=magenta`
    - Links to local files will be shown in magenta color
  - `urlcolor=cyan`
    - Links to web sites are set to cyan

Hyperlink (web)files

- Links to a web address can be added using:
  - `\url` command to display the actual link
  - `\href` to use a hidden link and show a word/sentence instead.
- `\href{https://www.kuleuven.be}{Some Link}`
- `\url{https://www.kuleuven.be}`
  - This will show the url passed as parameter and make it into a link, useful if you will print the document
- The commands `\href` and `\url` can also be used to open local files

Inserting links manually

- Cross-referenced elements become links once `hyperref` is imported,
  - References to `\label` used in the document will create links
- Use `hypertarget` and `hyperlink` to create links manually
  - `\hypertarget` specifies the target (anchor) with an identifier
  - `\hyperlink` refers to the specifier
- *File: demo_hyperref_1*
- *File: demo_hyperref_2*
- *File: demo_hyperref_3*

Index

- An index is an alphabetical list of words and expressions with the pages of the document upon which they are to be found.
- Index creation involves some work, but LaTeX still makes it easier than doing it by hand.
- Use `makeindex`.
  - Tag keywords in the LaTeX source as index entries.
  - These tags cause LaTeX to record index information in a special output file.
  - Run `makeindex` to process this file to create an index that can be typeset by LaTeX.
- https://en.wikibooks.org/wiki/LaTeX/Indexing
- https://www.overleaf.com/learn/latex/Indices

Index

- Load makeidx package
  ```
  \usepackage{makeidx}
  ```
- Mark words to be indexed by enclosing them in a `\index` command, the text has to be repeated.
  ```
  Superconductors\index{superconductor} conduct
    electricity with zero resistance\index{resistance}.
  ```
- Start the indexing: Place a `\makeindex` command under the `\usepackage{makeidx}` command
- `\printindex` will print the index

Makeindex procedure

- TeXstudio: build + Tools>Index + build
- if you are using a command prompt, you will need to do:
  - pdflatex filename.tex
  - makeindex filename.idx
  - pdflatex filename.tex
- If you are also using BibTeX, you will need to do:
  - pdflatex filename.tex
  - bibtex filename
  - makeindex filename.idx
  - pdflatex filename.tex
  - pdflatex filename.tex

Sub-entries

- You can make an index with sub-entries, and sub-sub entries.
- The general form of \index is:
  `\index{`*`main_entry !sub_entry !sub_sub_entry`*`}`
- For example, an index entry of the form:
  ```
  \index{provinces!Ontario}
  \index{provinces!Saskatchewan}
  \index{provinces!British Columbia}
  ```
- *File: MyDocIndex*

Glossaries and Acronyms

- **Glossary**: an alphabetical list of terms in a particular domain of knowledge with the definition / explanation for those terms
- **Acronym**: an abbreviation formed from the initial letters of other words and pronounced as a word (*ASCII*, *NASA*)
- A possible improvement would be references to the locations in the text where those terms are used.
- https://en.wikibooks.org/wiki/LaTeX/Glossary
- https://www.overleaf.com/learn/latex/Glossaries

Glossaries

- Use package glossaries
  - `\usepackage{glossaries}`
- Create an entry with the command `\newglossaryentry`
- The command `\gls` produces the name of the term given the label
- `\printglossary` where you want your list of entries to appear
  - Alternatively, to display all glossaries use the iterative command: `\printglossaries`
- *File: demo_glossaries_simple.tex*
- *File: demo_glossaries.tex*

Glossaries: steps

- Overview of the steps to generate a glossary
  - Prepare the tex file
    - Load the package
    - Tell LaTeX to generate a glossary `\makeglossaries`
    - Define the terms and their definitions
    - Use the terms
    - Print the glossary `\printglossaries`
  - Compile the document
  - Generate the index file
  - Compile the document again
- http://texblog.org/2014/01/15/glossary-and-list-of-acronyms-with-latex/

Glossaries: tweaking the setup

- Need some setup tweaking in your editor!
  - http://brianhoffmann.de/journal/thesis/2011-08-01/latex-glossaries-with-texniccenter
- Note: if you want to use both glossaries and hyperref, you must load `hyperref` before `glossaries`. This is an exception to the usual advice of loading `hyperref` last.
  http://www.dickimaw-books.com/latex/thesis/html/makeglossaries.html
- Check documentation for beginners
  http://tug.ctan.org/macros/latex2e/contrib/glossaries/glossariesbegin.pdf

Acronyms

- The glossary and the list of acronyms can be displayed separately in different places:
  `\usepackage[acronym]{glossaries}`
- `\newacronym` to create an acronym
- `\printglossary[type=\acronymtype]` to print the list of acronyms
- *File: demo_acronyms_glossaries.tex*

Proclamations

- LaTeX does not by default provide an environment for theorems.
- 2 step procedure:
  - In the preamble, use a `\newtheorem` command to define the proclamation.
    `\newtheorem{thrm}{Theorem}`
  - 2 parameters, the first one is the name of the environment that is defined (thrm), the second one is the word that will be printed (Theorem)
  - In the document body
    - Use: `\begin{thrm} ...\end{thrm}`.
    - The second argument (Theorem) is used to label the statement (title).
- https://www.overleaf.com/learn/latex/Theorems_and_proofs

Proclamations

- LaTeX provides an environment to create theorem-like environments (can be extended by the amsthm).
  - `\usepackage{amsthm}`
  - `\newtheorem{theorem}{Theorem}`
  - `\newtheorem{corollary}[theorem]{Corollary}`
  - `\newtheorem{lemma}[theorem]{Lemma}`
  - `\newtheorem{definition}[theorem]{Definition}`
- use the following environments as appropriate:
  - `\begin{theorem}...\end{theorem}`
  - `\begin{corollary}...\end{corollary}`
  - `\begin{lemma}...\end{lemma}`
  - `\begin{definition}...\end{definition}`
  - `\begin{proof}...\end{proof} % from amsthm`
- http://www.maths.adelaide.edu.au/anthony.roberts/LaTeX/ltxenviron.php

Proclamations

- LaTeX automatically numbers theorems consecutively (independent of chapters, etc.)
- Use * to suppress
  - `\newtheorem*{thm2}{Theorem}`
- *File: demo_theorem_1.tex*
- In general, every `\newtheorem` has its own counter.
- The automatic numbering can be linked to other counters.
- `\newtheorem{cor}[theorem]{Corollary}`
- *File: demo_theorem_2.tex*

Proclamations

- Theorem numbers can be linked with sections, subsections, chapters…

```
\newtheorem{sectheorem}{Theorem}[section]
```

- Named theorem: pass the name as a parameter

```
\begin{theorem}[The first one]
This is an important theorem.
\end{theorem}
```

- *File: demo_theorem_3.tex*

Proclamations

- Generate a list of theorems
- Package: `thmtools`
- `\listoftheorems`
- *File: demo_theorem_4.tex*

Proclamations

- proof environment
  - Used for proofs.
  - Typesetting somewhat different from theorem
  - Ends with □

```
\begin{proof}
This is obvious.
\end{proof}
```

- *File: demo_proof.tex*

footnote

- The \footnote command places the numbered footnote text at the bottom of the current page.
- `\footnote{footnote text}`
- Referencing is possible
  - Place label inside the note
- *File: demo_footnote.tex*

- Numbering tweaks – see also `package{chngcntr}`
  - Article: 1, 2, …
  - Book, report: no reset per chapter
- *File: demo_footnote_number.tex*

endnotes

- No footnotes at the bottom of the page, but at the end of the document.
- `% In the preamble`
- `\usepackage{endnotes}`
- `\let\footnote=\endnote`
- `% In the document where you want the notes to be printed`
- `\newpage`
- `\theendnotes`
- *File: demo_endnotes.tex*
- https://www.sixhat.net/latex-continuous-footnote-numbers-and-footnote-to-endnote-conversion.html

Margin note

- Create notes in the margin is a really nice/cool feature in LaTeX.
- Edward Tufte: *it lets you keep your notes near your content, which is a good thing*.
- Only short text!
- `\marginpar`
- *File: demo_marginpar.tex*
- `marginnote` package can be used for more flexibility.
- `\marginnote{This note will appear in the margin.}`
- *File: demo_marginnote.tex*

Numbering

- Some document elements (e.g., figures in the book class) are numbered per chapter (figure 1.1, 1.2, 2.1, ...).
  How to achieve continuous numbering (figure 1, 2, 3, ...)?
- Some document elements (e.g., figures in the article class) are numbered continuously.
  How to achieve per-section numbering?
- Use package chngcntr
- https://tex.stackexchange.com/questions/28333/continuous-v-per-chapter-section-numbering-of-figures-tables-and-other-docume
- *File: MyLargeDoc-numbering*
- *File: MyArticle-numbering*

Extra commands

- `\frontmatter` turns off chapter numbering and uses roman numerals for page numbers;
- `\mainmatter` turns on chapter numbering, resets page numbering and uses arabic numerals for page numbers;
- `\appendix` resets chapter numbering, uses letters for chapter numbers and doesn't fiddle with page numbering;
- `\backmatter` turns off chapter numbering and doesn't fiddle with page numbering.
- The hard-and-fast rule:
  - Don't use \appendix after \backmatter, because chapter numbering has already been turned off by \backmatter.
- *File: MyLargeBook-input.tex*
- Taken from: http://tex.stackexchange.com/questions/20538/what-is-the-right-order-when-using-frontmatter-tableofcontents-mainmatter

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Introduction to LaTeX

bibliography

Contents

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Bibliography

- A bibliography is a list of the literature that has been used for the work.
- Requirements:
  - Correct: All the information (especially authors, title, and year) should be correct.
  - Complete: All the literature that is referred to (and only this literature) should appear in the bibliography
  - Uniform: All the information should be displayed in the same style.

Bibliography

- A bibliography can be:
  - included manually
    - Not really an option
  - embedded, using `thebibliography` environment
    - Simple method
    - Can be used for short reference lists, or when the formatting is very special
  - automatically generated from a database
    - Should be the way to go
- https://en.wikibooks.org/wiki/LaTeX/Bibliography_Management

Big picture

- Best practice: keep all of your references in a database.
- in LaTeX:
  - cite using a simple command (`\cite{key}`)
    - use a “key” linking what you want to cite with an entry in the database (.bib) file.
  - in the LaTeX document, indicate to include a bibliography and specify the style you want
  - All of the formatting and inserting the actual citation will be taken care of.

https://jabranham.com/blog/2015/09/reference-management.html

Big picture

- 3 bibliography management packages in LaTeX:
  - BibTeX (included in LaTeX by default),
  - natbib (a package based on BibTeX),
  - BibLaTeX.
- BibTeX and natbib (widely used, no longer developed)
- BibTeX is still the de-facto standard that most users know. Moreover, most academic publishers (that support LaTeX) do not support BibLaTeX
- Biblatex and biber (the future)
  - BibLaTeX provides a more flexible interface and a better language localization
- https://tex.stackexchange.com/questions/25701/bibtex-vs-biber-and-biblatex-vs-natbib

thebibliography

- Syntax

```
\begin{thebibliography}{widest_label}
\bibitem[label]{key} reference
...
\end{thebibliography}
```

  - *widest_label*: should be as wide as the widest label. Will help LaTeX to align the references correctly.
  - *label*: overrides the default label (a running number).
  - *key*: reference key used in text.
  - *reference*: author, title, etc. information (may include formatting).

thebibliography

- `thebibliography` environment produces a bibliography or reference list.
  - In the article style, this reference list is labeled "References";
  - in the report style, it is labeled "Bibliography".
- similar to the enumerate environment, except that items are associated with a `\bibitem` command and can be cross-referenced with the `\cite{key}` command.
- *File: demo_thebibliography_1.tex*

thebibliography

- By default, the bibliography items are given consecutive numeric labels, set in square brackets. [1], [2], [3], [4].
- Also allowed
  - `\cite{Erdos01,Simpson}`
  - `\cite[pages~2--15]{Knuth92}`
- Explicit labels.
  - Use mnemonic labels instead of the default numeric labels.
  - label the items [Er01], [GKP89], [Kn92], and [Si03]. Label this explicitely in bibitem:
    `\bibitem[Er01]{Erdos01} .... \bibitem[Si03]{Simpson} ....`
- *File: demo_thebibliography_2.tex*

Hands-on

- Use *handson_thebibliography_1,* compile it and check the output. Change the bibitem entries, such that a label is shown instead of a number

For more information about writing bibliographies see Goossens *et al.* [3].
For more information about writing bibliographies see Goossens *et al.* [3].
For more information about writing bibliographies see [2, 3].
For more information about writing bibliographies see Goossens *et al.* [3, Chapter 13].

Luckily, many text editors include the ability to switch end-of-line codes; some even do so automatically"[4]

References

[1] "LaTeX : a document preparation system", Leslie Lamport, 2nd edition (updated for LaTeX2e), Addison-Wesley (1994).

[2] "A Guide to LaTeX2e: document preparation for beginners and advanced users", Helmut Kopka and Patrick W. Daly, Addison-Wesley (1995).

Possible Workflow in Scientific Writing

- Collect / organize your references in Reference management software.
  - Zotero
  - Mendeley
  - Endnote
  - Etc.
- Reformat the database to Bibtex/BibLaTeX format.
- Use the database in LaTeX.

Working with a database: steps

- BibTeX/BibLaTeX translates bibliographic databases into a properly formatted citation list according to a pre-defined bibliographic style that you choose
- Inside LaTeX: required steps to set a bibliography using BibTeX/BibLaTeX:
  - Create a "BibTeX/BibLaTeX database“ (.bib)
  - Choose a bibliography style
  - Load the database(s)
  - Process the paper through multiple runs of latex and BibTeX/BibLaTeX.

Working with a database

- DIY can be complex

http://guides.nyu.edu/c.php?g=601858&p=4198226

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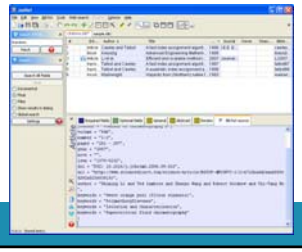
JabRef

- A bibliography reference manager. A GUI front end to manage BibTeX files.
- Cross-platform
- The native file format is BibTeX, the standard LaTeX bibliography format.



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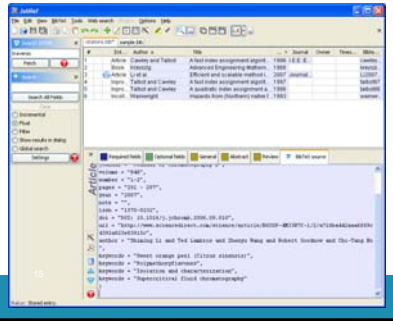
JabRef

- Paste the BibTeX code into the BibTeX source field
- Or edit the *.bib file



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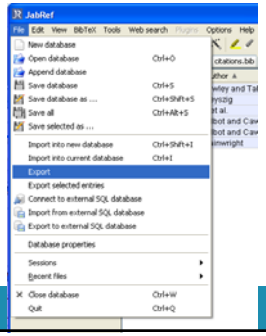
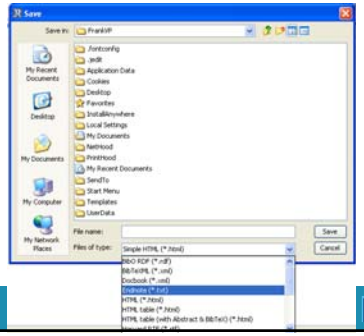
JabRef

- JabRef can export files that can be imported into EndNote.





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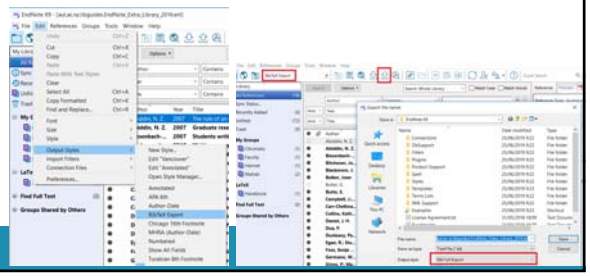
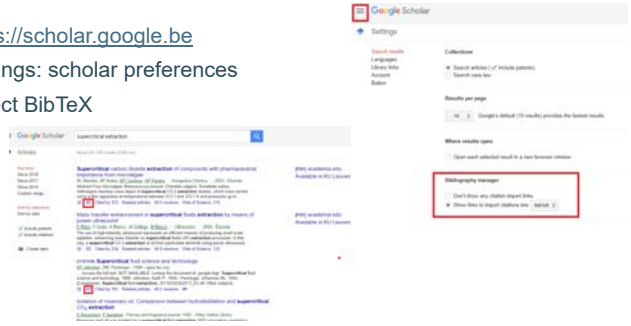
EndNote & BibTeX

- Exporting from EndNote to BibTeX
- Select the output style (Edit > Output Styles > Output Styles Manager)
- Export
- Change the extension .txt to .bib



BibTeX & Google Scholar

- https://scholar.google.be
- Settings: scholar preferences
- Select BibTeX



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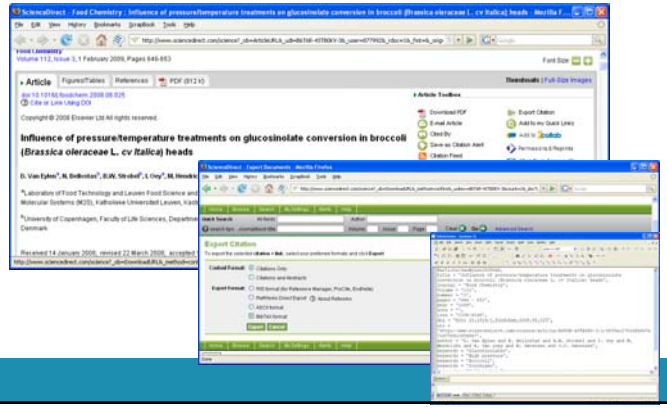
BibTeX & E-sources



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Basic usage / commands

	BibTex	BibLaTeX
Packages Needed	None	biblatex
In document command for citation	\cite{bibID}	\cite{bibID}
Specify bib files Specify the filename(s) in	\bibliography (different bibfiles separated with comma, no spaces)	\addbibresource (addbibresource for each bib file)
Bibliography styles	Use command (place in body): \bibliographystyle{stylename} Common Stylenames: abbrv acm alpha apalike ieeetr plain siam unsrt	Optional Argument of \usepackage: \usepackage[style=stylename,]{biblatex} Common Stylenames: numeric alphabetic authoryear authortitle verbose reading draft
Print bibliography command	\bibliography{bibfilename}	\printbibliography

http://guides.nyu.edu/c.php?g=601858&p=4198226

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What has BibTeX to offer?

- Have the bibliography in a separate file and reuse it with every LaTeX document.
  No need to rewrite the bibliography every time.
- BibTeX only shows the resources which have been referenced using the `\cite` command, in addition to other resources which have not been explicitly referenced but have been enforced to display using the `\nocite` command.
- Entries are sorted (default by author)
- Entries are consistently formatted (provided the database is consistent)
- Graphical user interfaces exist for editing .bib (Bibliographic Information File) files (Jabref)

BibTeX

- BibTeX extracts references from one or more data files, formats them according to the given bibliography style and includes them into the document.
  - Different records are used for different publications
    - @InProceedings {...} @Article {...} @Book {...}
    - @MastersThesis {...} @PhdThesis{...} @TechReport{...}
  - Data is entered in a set of fields

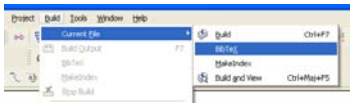
```
publication type {label,
  Key={key},
  Author={author list},
  Title={title},
  ...
}
```


BibTeX

- The reference section and individual references are created according to the given bibliography style.
  - `\bibliographystyle{citation style}` defines the style
  - `\bibliography{data files}` includes the references
- BibTeX automatically includes all cited references and includes them in the reference section.
  - Citations are included in the text using
    `\cite{label}`
  - Additional references can be included in the reference section using
    `\nocite{label}`

Creating output

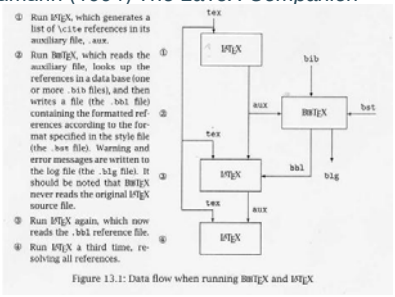
- To create references, run the sequence:
  - latex
  - bibtex
  - latex
  - latex



- *File: demo_bibtex_1.tex*
- *File: demo_bibtex_2.tex*

BibTeX cycle

- Goosens, Mittelbach, and Samarin (1994) *The LaTeX Companion*



BibTeX styles

- https://nl.sharelatex.com/learn/Bibtex_bibliography_styles
- `plain` Sorts entries alphabetically, with numeric labels.
- `abbrv` First names, month names, and journal names are abbreviated.
- `acm` Names are printed in small caps. alpha Alphanumeric labels, e.g., `Knu66'.
- `apalike` No labels at all; instead, the year appears in parentheses after the author. Should be used in conjunction with `apalike.tex' (plain *TeX*) or `apalike.sty' (La*TeX*), which also changes the citations in the text to be `(*author*, *year*)'.
- `ieeetr` Numeric labels, entries in citation order, IEEE abbreviations, article titles in quotes.
- `unsrt` Lists entries in citation order, i.e., unsorted.

Hands-on

- Use the file *handson_biblio_1,* compile and check the result.
- Change the style of the referencing.
- Add more text and references, use also the `\nocite` command

BibLaTeX

- The `biblatex` package is a reimplementation of LaTeX's bibliographic facilities.
- The formatting of the bibliography is governed by LaTeX commands instead of selecting a BibTeX style (`\bibliographystyle`).
- uses `biber` instead of `BibTeX` to process the bibliographic database and sort the entries.
  - Legacy BibTeX is also supported, but with a reduced feature set.
  - biber is the new parser for .bib files (replacement for BibTeX)

BibLaTeX

- Load the package biblatex
  - `\usepackage{biblatex}`
- Specify the bib file(s) with `\addbibresource` (multiple lines when using multiple files)
- Insert a citation with `\cite`
- Insert the bibliography with `\printbibliography`

BibLaTeX

- different citation commands:
- `\cite` - the most basic one. Prints without any brackets except when using the alphabetic or numeric style,
- `\parencite` - prints citations in parentheses except when using the alphabetic or numeric style when it uses square brackets.
- `\footcite` - puts the citation in a footnote.

BibLaTeX

- Change the automation settings in your editor!
- *File: demo_biblatex_1.tex*

- http://dag.at.ifi.uio.no/public/doc/biblatex-guide.pdf
- http://www.dickimaw-books.com/latex/thesis/html/biblatex.html
- https://guides.library.yale.edu/bibtex/biblatex-biber
- http://www.uakron.edu/dotAsset/2f7e00a5-3bb4-42b5-96c0-e16e0fb971d6.pdf
- https://3d.bk.tudelft.nl/hledoux/blog/fiddling-biblatex/

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Introduction to LaTeX

Extra

Contents

Creating commands

- For sequences of commands frequently used, use it is a good idea to write your own command.
- This saves time and prevents errors
- Define (in the preamble or separate file) your new commands:
- `\newcommand{\nameOfCommand}[numberOfInputs]{sequences}`
  Once you defined your command, you can use it as any other command:
  - `\newcommand{\water}{H$_2$O}`
    The formula for water is \water.

Creating commands

- New commands may be defined or redefined under LaTeX with:
- `\newcommand{\NewName}{def}`
- `\renewcommand{\Name}{def}`
- The first version is used to define a command that does not yet exist, the second version is used to redefine a command that already exists.
- Passing parameters is possible
- *File: demo_newcommand_01.tex*
- *File: demo_newcommand_02.tex*

Use of lengths

- Many predefined lengths. These definitions can be overriden with \setlength:
- `\setlength{\lengthname}{value_in_specified_unit}`

Length	Description
\baselineskip	Vertical distance between lines in a paragraph
\columnsep	Distance between columns
\columnwidth	The width of a column
\evensidemargin	Margin of even pages, commonly used in two-sided documents such as books
\linewidth	Width of the line in the current environment.
\oddsidemargin	Margin of odd pages, commonly used in two-sided documents such as books
\paperwidth	Width of the page
\paperheight	Height of the page
\parindent	Paragraph indentation
\parskip	Vertical space between paragraphs
\tabcolsep	Separation between columns in a table (tabular environment)
\textheight	Height of the text area in the page
\textwidth	Width of the text area in the page
\topmargin	Length of the top margin

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Length units

Abbreviation	Value
pt	a point is approximately 1/72.27 inch, that means about 0.0138 inch or 0.3515 mm (exactly point is defined as 1/864 of American printer's foot that is 249/250 of English foot)
mm	a millimeter
cm	a centimeter
in	inch
ex	roughly the height of an 'x' (lowercase) in the current font (it depends on the font used)
em	roughly the width of an 'M' (uppercase) in the current font (it depends on the font used)
mu	math unit equal to 1/18 em, where em is taken from the math symbols family

https://www.sharelatex.com/learn/Lengths_in_LaTeX

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Lengths

- lengths can not only be set to any desired value, they can also be used as units to set the dimensions of other LaTeX elements.
- `\includegraphics[width=0.2\textwidth]{fiets.jpg}`
- Other possible setting method
  `\addtolength{\textwidth}{2in}`

- http://www.eng.cam.ac.uk/help/tpl/textprocessing/squeeze.html
- http://en.wikibooks.org/wiki/LaTeX/Lengths

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Hands-on

- Use demo_margin_01
- Change \textwidth to 7 cm
- Make the text width negative via \setlength{\textwidth}{-14cm}
- What happens if a very large textwidth is used via \setlength{\textwidth}{100cm}?

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Counter

- Counters are used to keep the right number attached to equations, pages, theorems, etc.
- Increase the value of the counter by number

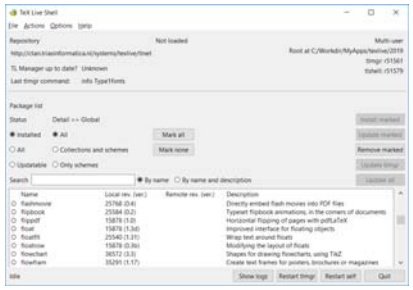
  `\addtocounter{CounterName}{number}`
- Set the counter value explicitly

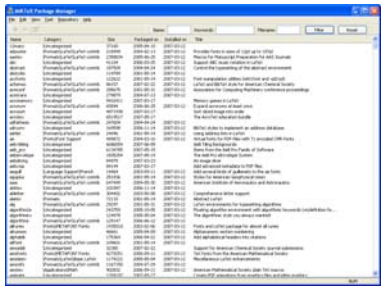
  `\setcounter{CounterName}{number}`
- Display the value of the counter

  `\theCounterName`
- *File: demo_counter.tex*

counters

Usage	Name
For document structure	part chapter section subsection subsubsection paragraph subparagraph page
For floats	equation figure table
For footnotes	footnote mpfootnote
For the enumerate environment	enumi enumii enumiii enumiv

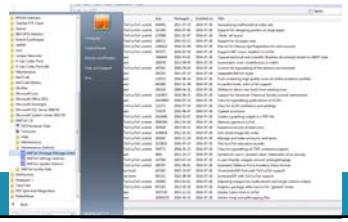




http://en.wikibooks.org/wiki/LaTeX/Packages

Packages

- Packages are used to alter or add features to the basic LaTeX behavior
- Finding and configuring packages usually requires some mojo (and Google)
  - Some packages will extend existing functions.
  - Some packages will add extra functions.
- Check under MikTex, TeXLive



Packages

- basic LaTeX cannot solve all your problems.
  - If you want to include graphics, colored text or source code from a file into your document, you need to enhance the capabilities of LaTeX.
- Packages are activated with
  - `\usepackage[`*`options`*`]{`*`package`*`}`
  - *package* is the name of the package
  - *options* is a list of keywords that trigger special features in the package.

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Package documentation

- most package documentation is provided as a PDF file
- If installed on your system, use `texdoc`
  - command prompt: `texdoc` followed by the name of the package.
  - `texdoc datetime`
  - Or via texdoc online website http://texdoc.net/
- if the documentation is not installed on your system, check CTAN. You can either navigate your way via
  - http://tug.ctan.org/ or
  - http://tug.ctan.org/pkg/*name*
    where *name* is the name of the package

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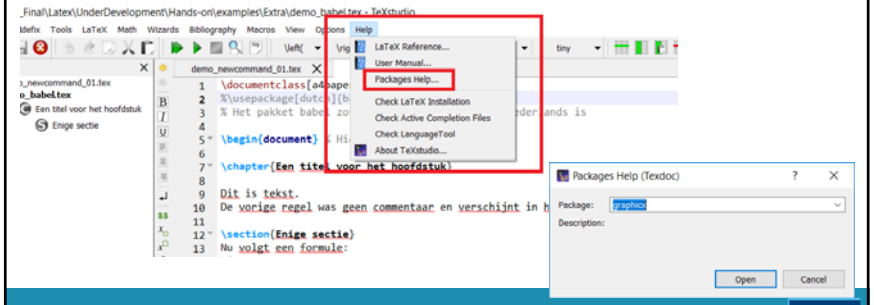
Package documentation

- TeXstudio provides an entry for documentation



Faculteit, departement, dienst ...

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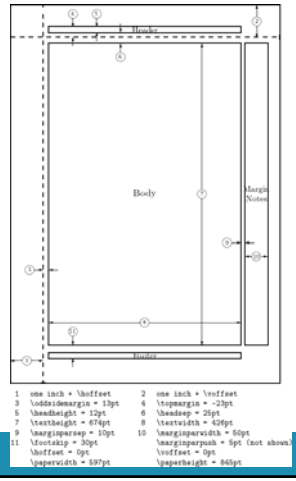
geometry

- `geometry` offers a simple way to change the length and layout of different elements such as the paper size, margins, orientation, etc.
- `\usepackage[letterpaper, landscape, margin=2in]{geometry}`
- See also https://nl.sharelatex.com/learn/Page_size_and_margins



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fancyhdr

- Package `fancyhdr`
- Invoke the `\pagestyle{fancy}`
- Header
  `\lhead{`*`text`*`}`, `\chead{`*`text`*`}`, and `\rhead{`*`text`*`}` will place text justified on the left, center, and right
- By default, the left header will be the section number and section title of the current page.
- Footer
  `\lfoot{`*`text`*`}`, `\cfoot{`*`text`*`}`, and `\rfoot{`*`text`*`}` will place text justified on the left, center, and right

fancyhdr

- Arguments to be used
- `\leftmark` name of current chapter.
- `\rightmark` name of current section.
- `\markboth` name of chapter, same as appearing in toc.
- `\markright` name of section, same as appearing in toc.
- `\thepage` page number.
- `\thechapter` current chapter number.
- `\thesection` current section number.
- *File: demo_fancyhdr_01.tex*

listings

- Use the `verbatim` package

```
\begin{verbatim}
your
code
example
\end{verbatim}
```

- Use the `listings` package
  - Code formatting can be tweaked
- *File: demo_listings.tex*

color

- Easiest way: use the package `color` or `xcolor`.
  - Both packages provide a common set of commands for color manipulation. `xcolor` is more flexible and supports a larger number of color models.
  - You can create your own colors. Check the documentation.
- The background color of the entire page can be easily changed with `\pagecolor`.
- *File: demo_xcolor_1.tex*

todonotes / cooltooltips

- todonotes
  - Add all the todos, create a list
  - *File: demo_todonotes.tex*
- cooltooltips
  - `\cooltooltip[<popup color>][<linkcolor>]{<subject>}{<message>}{<url>}{<tooltip>}{<text>}`
  - prints a box of color <link color> around <text>. Additionally, a popup of color <popup color> is displayed with a title <subject> and text <message> Hovering over <text> also brings up the tooltip <tooltip> and clicking the link takes you to <url>.
  - *File: demo_cooltooltips.tex*

endfloat

- Some journals require that tables and figures be separated from the text.
- The `endfloat` package moves all the figures and tables to the end of the document.
- `\usepackage{endfloat}`
- `\usepackage[nomarkers,tablesfirst,notablist]{endfloat}`

- *File: demo_endfloat.tex*

floatrow

- Center the float objects by default
- `\usepackage{floatrow}`

- Check endfloat example: demo_endfloat.tex
  - Use / skip the `floatrow` package and check the result
  - Rem. `floatrow` and `endfloat` interact, put `floatrow` first and `endfloat` after it

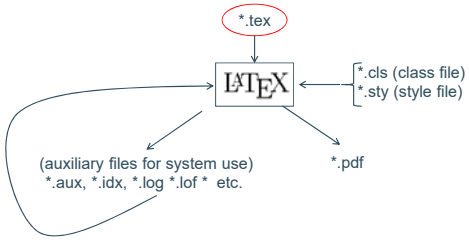
Common errors

- Preamble errors
- Missing or incorrect placement of }
- Blank lines or other spacing issues in math mode
- Forgetting about special characters, like $, %, & and quotation marks
- Misspelled environment or macro names
- Incorrect use of options or improper structure for an environment or macro
- Incorrect reference for numbering
- Mismatching braces, environments, “whatever”
- Schwartz: The art of LATEX problem solving, TUGboat, Volume 26 (2005), No. 1

Troubleshooting

- Insert ***\end{document}*** before the line with errors and move it further down the document until you identify the problem.
  Cody Chiuzan - http://people.musc.edu/~elg26/teaching/statcomputing.2013/statcomputingI.2013.htm
- Remove all auxiliary files

What do the file extensions mean?



LaTeX files

- .tex source file
- .cls class file
- .sty package/style file
- .log a log file
- .aux auxiliary file
- .toc table of contents file
- .lot a list of tables file
- .lof a list of figures file

LaTeX files

- .bib denotes a BibTeX source file. Such files contain the database from which the .bbl bibliography file is generated.
- .bst BibTeX style file
- .bbl LaTeX bibliography file
- .blg BibTeX log file.
- .idx MakeIndex index source file
- .ind LaTeX index file
- .ilg MakeIndex log file.