# Basic LaTeX

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# what is LaTeX?

- it's a typesetting markup language
- it's a set of macros that use TeX to format documents
- it's a powerful set of formatting commands that includes support for mathematical formulae, tables, sectioning, indexing, bibliographic referencing and citation, etc.

# what is LaTeX not?

- it's not a stretchy natural rubber product
- it's not a word processor
- it's definitely not WYSIWYG
- it's not for unstructured documents

# history

- TeX is a programming language for specifying typesetting
  - designed by Donald Knuth
  - first release in 1978
    mostly finished by 1989
  - really complicated, low-level, and picky!
  - rhymes with Blecchh…

# history

- LaTeX is a set of macros that builds upon TeX
- started as a set of macros by Leslie Lamport in the early 1980's ("Lamport's TeX")
- infinitely easier to deal with than "plain TeX"
- pronounced "lah-tekh" or "lay-tekh"

# how does it work?

- write a plain ASCII text file
- add LaTeX markup commands in the text
- **compile** that file into a professional-looking document layout
  - let LaTeX make a myriad of detailed typesetting and page-layout decisions…

# why LaTeX?

- separates the content of the document from the format
- allows very high-quality typesetting during the compilation process
- allows consistent look and feel for a family of documents
- great support for bibliographic databases / citations

# (very) basic document structure

```
% comments start from %, go to end of the line
% commands all start with "\"

\documentclass{…}        % what sort of doc?
\usepackage{…}           % any special add-ons?
\begin{document}         % setup done, start doc

text of your document

\end{document}           % end of the document
```

```
% Perhaps the simplest LATEX document possible…
\documentclass{article}
\begin{document}

Hello world!

\end{document}
```


```
% Perhaps the simplest LATEX document possible…
\documentclass{article}
\begin{document}

Hello world!

\end{document}
```


switch to demo….

# LaTeX IDEs

- I use TeXShop on my Macbook
  - http://pages.uoregon.edu/koch/texshop/texshop.html
- TeXmaker, TeXstudio, TeXworks, … (local IDE)
- Overleaf, ShareLaTeX, Authorea, …(web-based)
- TeXlipse (if you really like Eclipse)

# more details

- **special characters:** # $ % ^ & _ { } ~ \
  - these will not print as regular characters
- you can escape them with a backslash (except for backslash!)
  - \# \$ \% \^{} \& _ \{ \} \~{} \textbackslash

# more details

- Commands start with a \

  *command* [*optional-parameter*] {*parameter*}

  You can \textsl{lean} on me!

  You can *lean* on me!

# font styles

- Generally two techniques

  \emph{ emphasized }  {\em emphasized }
  \textsf{ sans-serif }  {\sffamily sans-serif }
  \textit{ italic text }  {\itshape italic text }
  \textbf{ boldface }  {\bfseries boldface}

  \textnormal{}, \textrm{}, \texttt{}, \textsl{}, \textsc{},
  …

# font sizes

- commands hold until changed
  so you might want a new scope

  {\small this is very small text}

  \tiny, \scriptsize, \footnotesize, \small, \normalsize,
  \large, \Large, \LARGE, \huge, \Huge

# font choices

- surprisingly complex… TeX/LaTeX are old enough
  that they predate modern conventions…

  % change serif to Times, sans-serif to Helvetica,
  % monospaced to Courier
  \usepackage{times}

  other choices: <default>, lmodern, mathptmx,
  palatino, bookman, newcent, charter, chancery,
  avant, …

# font choices

- surprisingly complex… TeX/LaTeX are old enough that they predate modern conventions…

```
% change to a better font! (Some people have
% strong opinions about fonts!)
\usepackage{mathptmx}
```

other choices: <default>, **lmodern, mathptmx**, palatino, bookman, newcent, charter, chancery, avant, …

# font choices

- LaTeX style files will usually choose fonts for you
- best to stick with the defaults, or the simple "usepackage" options for now
- or go somewhere like http://www.tug.dk/FontCatalogue/ for examples

# sectioning commands

- LaTeX is all about structure…

\chapter{}, \section{}, \subsection{},
\subsubsection{}, \paragraph{}

```
\documentclass[11pt]{article}  % resize the overall font

\title{Very Small Document} % define the title and author
\author{Erik Brunvand}

\begin{document}   % begin the document
\maketitle         % generate the title

\section{Introduction}
This is the start of the article.

\section{Second Section}
Here's some additional text in another section
\subsection{Really?}
I don't think I really need a sub-section yet, but just for fun
\ldots{}

\end{document}
This text will not show up in the output.
```

# options

\documentclass[options]{types}

**options:** 10pt, 11pt, 12pt, a4paper, letterpaper, twocolumn, twoside, landscape…

**native types:** article, report, book, proc

**provided types:** IEEEtran,ieeeconf, sig-alternate, acmsiggraph, nsfprop, egpubl, vgtc, jpaper…

# other environments

```
\begin{itemize}
\item This is the first item
    \begin{itemize}
    \item Here's a sub-bullet
    \item And another sub-bullet point
    \end{itemize}
\item Here's another item
\item And another \ldots{}
\end{itemize}
```

# other environments

```
\begin{enumerate}
\item This is the first item
    \begin{enumerate}
    \item Here's a sub-bullet
    \item And another sub-bullet point
    \end{enumerate}
\item Here's another item
\item And another \ldots{}
\end{enumerate}
```

# other environments

```
\begin{description}
\item[First:] This is the first item
    \begin{enumerate}
    \item Here's a sub-bullet
    \item And another sub-bullet point
    \end{enumerate}
\item[Another Point:] Here's another item
\item[Still Another:] And another \ldots{}
\end{description}
```

# figures

```
%Latex needs help including images…
\usepackage{graphicx}

\begin{document}

 \begin{figure}
    \centering
    \includegraphics[width=4.2in]{images/AnImage}
    \caption{Images can be jpg, png, pdf, eps (eps may
                require the epstopdf package)}
    \label{figure-handle}
\end{figure}

In the text you can refer to this as Figure~\ref{figure-handle}.
```

# bibliography

- two parts:

  1. the bibliographic database (another text file)

  2. the bibtex program (compiles the bibliography)

# bibliography

In the text you can cite things with \cite{citation-key}. This will extract the citation from the database, generate a citation number, and put the reference into your references section.

\bibliographystyle{reference-type}
\bibliography{/path/to/your/bib/file}

# bib file format

```
@InProceedings{kopta-HPG13,
   title =       {An Energy and Bandwidth Efficient Ray Tracing Architecture},
   author =   {Daniel Kopta and Konstantin Shkurko and Josef Spjut and Erik Brunvand and Al Davis},
   booktitle =    {High-Performance Graphics (HPG  2013)},
   year =     2013,
   organization  = {ACM}
}

text outside of the entries is treated as a comment…
@Article{kopta-CGF14,
   author =   {D. Kopta and K. Shkurko and J. Spjut and E. Brunvand and A. Davis},
   title =       {Memory Considerations for Low Energy Ray Tracing},
   journal =   {Computer Graphics Forum},
   volume =  {34},
   number = {1},
   issn =       {1467-8659},
   url =        {http://dx.doi.org/10.1111/cgf.12458},
   doi =        {10.1111/cgf.12458},
   pages =   {47--59},
   year =     {2015},
}
```

# bibliography

In the text you can cite things with \cite{kopta-HPG13,kopta-CGF14}. This will extract the citation from the database, generate a citation number, and put the reference into your references section.

```
\bibliographystyle{plain} % plain, alpha, acm, ieeetr
\bibliography{/bib/example.bib} % file path
```

# moving on…

- equations and mathematical formatting
- figures
- tables
- modifying standard environments
- using ACM/IEEE templates
- etc. etc. etc…