

# Introduction to and Basics of $\text{\LaTeX}$

Sponsored by Qualcomm

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# Outline

- 1 Overview
  - A Quick “Hello World”
  - What is  $\text{\LaTeX}$ , anyway?
  - How to use  $\text{\LaTeX}$
  - The Language and Syntax
- 2 Examples
  - Floats, Figures, Tables
  - Other examples
- 3 External Examples

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# Code

```
\documentclass{article}
\title{Cartesian closed categories %
      and the price of eggs}
\author{Jane Doe}
\date{September 1994}
\begin{document}
  \maketitle
  Hello world!
\end{document}
```

# In English this time

- This document is an article.
- Its title is “Cartesian closed categories and the price of eggs”.
- Its author is Jane Doe.
- It was written in September 1994.
- The document consists of a title followed by the text “Hello world!”

# Results

Cartesian closed categories and the price of eggs

Jane Doe

September 1994

Hello world!

What is  $\text{\LaTeX}$ , anyway?

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What is  $\text{\LaTeX}$ , anyway?

# $\text{\TeX}$

...before  $\text{\LaTeX}$

- Typesetting system created by Donald Knuth
- Anybody could produce high-quality typography (in theory)
- Made to typeset complex mathematical formulae
- Popular in academic settings
- Difficulty and effort required gave rise to simplifications...





What is L<sup>A</sup>T<sub>E</sub>X, anyway?

... enter L<sup>A</sup>T<sub>E</sub>X

“Lah-tech” or “Lay-tech” as in Greek  $\tau\epsilon\chi$

- Package of macros based on T<sub>E</sub>X
- Created by Leslie Lamport
- Simplifies T<sub>E</sub>Xtypesetting, especially for mathematical formulae
- Many additional packages and styles contributed by the community
- Archived in the Comprehensive TeX Archive Network (CTAN)<sup>1</sup>

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<sup>1</sup><http://www.ctan.org/>

What is  $\text{\LaTeX}$ , anyway?

# The many facets of $\text{\LaTeX}$

- $\text{\LaTeX}$  refers to multiple things
- NOT a Word-Processor (e.g. Microsoft Word)
- WYSIWYM instead of WYSIWYG
  - What-You-See-Is-What-You-Mean (semantics), versus
  - What-You-See-Is-What-You-Get (visual syntax)
- Document Preparation System
  - Made for high-quality typesetting
  - Commonly used for technical/scientific documents
- Document Markup Language
  - Similar to HTML. (IMHO - could be better)

What is  $\text{\LaTeX}$ , anyway?

# Disadvantages

- Lack of a 'Live Preview', must be compiled to view results. (This is general to all WYSIWYM systems.)
- Must learn the markup language and command syntax.
  - Programmers feel right at home, but others may find this a difficulty in using  $\text{\LaTeX}$
  - Users only need to learn as much syntax as they want to use
  - General to all markup languages
- Difficult to manually adjust the typesetting
  - This is frustrating to those familiar with WYSISYG editors
  - This is actually considered an advantage by users familiar with  $\text{\LaTeX}$

What is  $\text{\LaTeX}$ , anyway?

# Advantages

- Forces authors to focus on the content (what you want to say) instead of the layout (how it looks on the page)
  - This often trips up new users, who think of this as a requirement for document creation
- The visual layout is consistent throughout a document
- Separation of content and style (like CSS on web pages) enables users to work on each separately
- Mathematical Formulae (LaTeX is the standard)
- Indexes, ToC's, Footnotes, References and Bibliographies are easily and cleanly generated
  - Compare to WYSIWYG editors
  - Requires authors to correctly structure their documents
  - Benefits the reader as well

# Outline

## 1 Overview

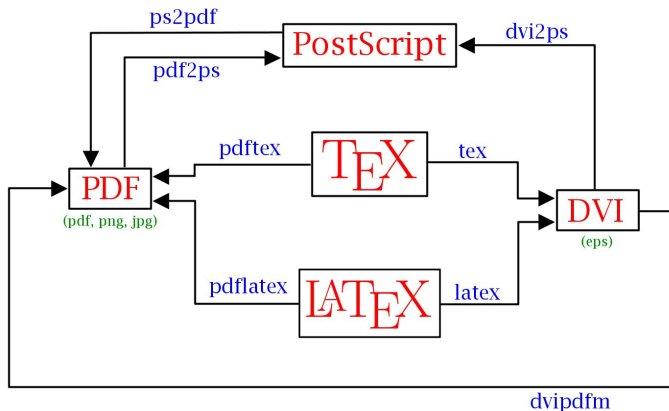
- A Quick “Hello World”
- What is  $\text{\LaTeX}$ , anyway?
- **How to use  $\text{\LaTeX}$**
- The Language and Syntax

## 2 Examples

- Floats, Figures, Tables
- Other examples

## 3 External Examples

# L<sup>A</sup>T<sub>E</sub>X, the Document Creation System



# Simple Usage

- The simplest usage case is using a general (raw) text editor:
  - Examples: NotePad, Emacs, Vim, Notepad++, Wordpad
- Documents are compiled via the command line
  - Programs to compile .tex source: `tex`, `latex`, `pdftex`, `pdflatex`
  - Programs to convert documents between types: `dvi2ps`, `ps2pdf`, `pdf2ps`
- Familiar approach to those that work in these (text) editors often
- Foreign approach to those used to WYSIWYG editors (everyone else)

# Integrated Development Environments

- Mac OS X
  - T<sub>E</sub>Xshop – <http://www.uoregon.edu/~koch/texshop/>
- Windows
  - LEd (L<sup>A</sup>T<sub>E</sub>X Editor) – <http://www.latexeditor.org>
  - T<sub>E</sub>XnicCenter – <http://www.texniccenter.org>
- Linux
  - Kile – <http://kile.sourceforge.net/>
- Multiplatform
  - T<sub>E</sub>Xmaker – <http://www.xm1math.net/texmaker/>
  - LyX – WYSIWYM – <http://www.lyx.org/>



# Extending L<sup>A</sup>T<sub>E</sub>X

- Packages are sets of macros, commands, document classes, etc. that extend L<sup>A</sup>T<sub>E</sub>X functionality past the base language.
- Examples include `Beamer`-used to create this presentation, and `AMSMath`-the ubiquitous Mathematics package.
- Huge number of packages available-all user contributed (karnaugh maps, finite state automata, analog circuit diagrams, ...)
- Usenet was the old go-to for L<sup>A</sup>T<sub>E</sub>X packages, but has since become outdated.
- Use CTAN, the Comprehensive T<sub>E</sub>X Archive Network.

*<http://www.ctan.org/>*



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# Syntax

- Comments begin with ‘%’ and go to the end of the line
- Extend all the way through the next line’s whitespace
- Commands begin with ‘\’
  - Optional Parameters go after command in []’s
  - Required Parameters go after command in {}’s
  - E.g. `\cmdname[opt1,opt2,...]{arg1}{arg2}...`
- Extra whitespace is ignored
- Environments are marked with `\begin{}` and `\end{}`
- Control Characters need to be escaped:

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

# Text Formatting

- **Sizes:**

```
\tiny, \scriptsize, \footnotesize,
      \small, \normalsize, \large, \Large
```

- *Emphasis:* `\emph{...}` *Also:* `{\em ...}`

- **Quotes:**  $\text{\LaTeX}$  differentiates between ‘ and ’.

- Single ``quote'`: Single ‘quote’
- Double ```quote`: Double “quote”

- **Sub- and Superscript:** `\textsubscript{...}` and `\textsuperscript{...}`

- **Boldface** `{\bf ...}`, *Italics* `{\it ...}`, **SMALL CAPS** `{\sc ..}`

# Paragraph Formatting

- **Alignment:**
  - **Left Justified:** `\begin{flushleft}` and `\raggedleft`
  - **Right Justified:** `\begin{flushright}` and `\raggedright`
  - **Centered:** `\begin{center}` and `\centering`
- **Line Spacing:**
  - **Entire Document:** Use `\linespread{...}` in the preamble. `\linespread{1.3}` will yield  $1\frac{1}{2}$  line spacing, while `\linespread{1.6}` will yield double.
  - **Section of Text:** Include `\usepackage{setspace}` in the preamble, which provides the `singlespace`, `onehalfspace`, `doublespace` and `spacing` environments.
    - `\begin{doublespace}` or `\begin{spacing}{1.6}`

# Verbatim and Lists

- Verbatim: Outputs exactly what is typed
  - `\begin{verbatim}...\end{verbatim}`
- Itemize:
  - `\begin{itemize}...\end{itemize}`
- Enumerate:
  - `\begin{enumerate}...\end{enumerate}`
- Description:
  - Environment Syntax: `\begin{description}`
  - Item Syntax: `\item[Description]`
- Each item is designated by the `\item` command.
- Different list types can be nested.

# Math Environments

- $\text{\LaTeX}$  uses two different environments for mathematical formulae:
  - *text* – Formulae are displayed in-line, within the body of text. Good for small equations.
    - $\$ \dots \$$  (e.g.) ... thus arriving at  $a^2 + b^2 = c^2$ , which is the Pythagorean Theorem.
  - *displayed* – Formulae are displayed separated from the text. Good for large equations.
    - $\backslash[ \dots \backslash]$  (e.g.) ... which yields Stoke's Theorem:

$$\int_{\Sigma} \nabla \times \mathbf{F} \cdot d\Sigma = \oint_{\partial\Sigma} \mathbf{F} \cdot d\mathbf{r} \quad (1)$$

- Always include the `amsmath` package by using the command `\usepackage{amsmath}`.

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# Figures

- When compiling with *latex*, only Encapsulated Postscript (EPS) files can be imported.
- Compiling with *pdflatex* allows JPG, PDF, and PNG formats to be imported.
- By using the `draft` option in the `\documentclass[...]{...}` command in the preamble, image output can be suppressed and every image will be replaced by the name of that image.
- Remember to include the command `\usepackage{graphicx}`.
- Use floats! (`\begin{figure}` and `\begin{table}`)

# Figures by Example



**L<sup>A</sup>T<sub>E</sub>X Code:**

```
\begin{figure} \begin{center}  
\includegraphics[width=0.3\textwidth]{lena.jpg}  
\end{center} \end{figure}
```



# Figures by Example



Figure: A Liquid Crystal

## L<sup>A</sup>T<sub>E</sub>X Code:

```
\begin{figure}[h] %t, b, p, !, and H (with \usepackage{float})
  \begin{center} \vspace{-5pt}
    \reflectbox{\includegraphics[scale=0.1, angle = -15]{lena.jpg}}
    \label{CNematic}
    \caption{A Liquid Crystal} \vspace{-10pt}
  \end{center}
\end{figure}
```

# Tables by Example

Component	Target (%)	Target (g)	Actual (g)	Actual(%)
RMS03-010C	98.2 %	.5024 g	.5032 g	98.4 %


**Table:** A Table of Measurements

## L<sup>A</sup>T<sub>E</sub>X Code:

```
\begin{table}
  \begin{tabular}[c]{|l || c | c | c | c |}
    \hline
    Component&Target (\%)&Target (g)&Actual (g)&Actual(\%)\\
    \hline
    RMS03-010C & 98.2 \% & .5024 g & .5032 g & 98.4 \% \\
    \hline
  \end{tabular}
\end{table}
```



# Referencing Labels

- As seen before, an object can be labeled by using the `\label{...}` command.
- This object can be referenced using this label with the command `\ref{...}`. This will print the number assigned to the object.
- Similarly, `\pageref{...}` will print the page number of the referenced object.
- Be sure to use `\label{...}` *after* `\caption{...}`. Otherwise, the reference will be attached to the current section or list number.
- Lists of Tables and Lists of Figures can be created by using `\listoftables` or `\listoffigures`. This will create a numerically ordered list of floats, complete with captions. 



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# Presentation fun

You can create overlays...

- using the `pause` command:
  - First item.
  - Second item.
- using overlay specifications:
  - First item.
  - Second item.
- using the general `uncover` command:
  - First item.
  - Second item.

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# Any Questions?

This presentation will be posted online for reference.  
 $\text{\LaTeX}$  is much too large a topic to cover in one sitting, but hopefully this is a good start.

Other References:

- Wikipedia article on  $\text{\LaTeX}$
- $\text{\LaTeX}$  Project Site
- Wikibook on  $\text{\LaTeX}$