A presentation in \LaTeX\ Beamer on \TeX/\LaTeX

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The Name of the Game

From the \TeXbook

English words like ‘technology’ stem from a Greek root beginning with the letters $\tau\epsilon\chi$ . . .; and this same Greek word means \textit{art} as well as technology...

Insiders pronounce the $\chi$ of \TeX as a Greek chi, not as an ‘x’, so that \TeX rhymes with the word blechhh... When you say it correctly to your computer, the terminal may become slightly moist.
One of the hardest things about \LaTeX{} is deciding how to pronounce it. This is also one of the few things I’m not going to tell you about \LaTeX{}, since pronunciation is best determined by usage, not fiat. \TeX{} is usually pronounced teck, making lah-teck, and lay-teck the logical choices.
Typesetting vs. Ordinary Typing

- Typesetting is the art of putting letters on a page
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- Ligatures appear in professional typesetting, such as in the word find (rather than find)
Typesetting vs. Ordinary Typing

- Typesetting is the art of putting letters on a page
- Ligatures appear in professional typesetting, such as in the word find (rather than find)
- Typesetting can involve complex mathematics, of which \( \text{T\&E}_\text{X} \) handles quite well

\[
\sum_{n=0}^{\infty} a_n z^n \text{ converges if } |z| < \left( \lim_{n \to \infty} \sqrt[n]{|a_n|} \right)^{-1}.
\]
$$-\int_0^{2\pi} \frac{kQ \, d\theta}{2\pi (a^2 + x^2)^{3/2}} (a \sin \theta \, \hat{j}) = 0$$
Structure of a \LaTeX{} Document

Preamble

\begin{document}
\documentclass[12pt]{article}
\usepackage[margin=25mm]{geometry}
\begin{document}
Hello World from \LaTeX{} !
\begin{equation}
\sum_{n = 0}^{\infty} \frac{x^n}{n!} = e^x
\end{equation}
\end{document}

Body

\begin{document}
\documentclass[12pt]{article}
\usepackage[margin=25mm]{geometry}
\begin{document}
Hello World from \LaTeX{} !
\begin{equation}
\sum_{n = 0}^{\infty} \frac{x^n}{n!} = e^x
\end{equation}
\end{document}

\end{document}

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Structure of a \LaTeX Document

Preamble
\begin{itemize}
\item \documentclass[12pt]{article}
\item \usepackage[margin=25mm]{geometry}
\end{itemize}

Body
\begin{itemize}
\item \begin{equation}
\sum_{n = 0}^{\infty} \frac{x^n}{n!} = e^x
\end{equation}
\item Hello World from \LaTeX !
\end{itemize}

Output
Hello World from \LaTeX!

\begin{equation}
\sum_{n=0}^{\infty} \frac{x^n}{n!} = e^x
\end{equation} 

(1)
Control Sequences

- Immediately after typing ‘\’, \TeX\ expects a control word or symbol.
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- A control word consists of a backslash followed by one or more *letters*.
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- A control word consists of a backslash followed by one or more letters.
- A control symbol consists of a backslash followed by a single nonletter.

Example: `\input MS' causes \TeX\ to begin reading a file called `MS.tex'.

Example: \TeX\ converts `George P\'olya and Gabor Szeg\"o' to `George P´ olya and Gabor Szeg¨ o.'

A space after a control word is ignored, to fix this, escape the space after a control word when required.

\TeX\ ignores spaces after control words.
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Control Sequences

- Immediately after typing ‘\’, \texttt{TEX} expects a control word or symbol.

- A control word consists of a backslash followed by one or more \textit{letters}.

- A control symbol consists of a backslash followed by a single \textit{nonletter}.

- Example: ‘\input MS’ causes \texttt{TEX} to begin reading a file called ‘MS.tex’.

- Example: \texttt{TEX} converts ‘George P\'olya and Gabor Szeg\"o’ to ‘George Pólya and Gabor Szegö’.

- A space after a control word is ignored, to fix this, escape the space after a control word when required. \texttt{\TeX} ignores spaces after control words.
This produces roman typeface output.

This produces slanted typeface output.

This produces italics typeface output.

This produces bold typeface output.

This produces typewriter typeface output.

This produces sans typeface output.
Installing TeX Live

Arch Linux:
# pacman -S texlive-most

Debian/Ubuntu/Mint:
# apt-get install texlive-full

Fedora:
# yum install texlive

Windows/OS X:
Follow instructions at http://tug.org
When you start `pdflatex`, you will see the following:

```
This is pdfTeX, Version 3.14159265-2.6-1.40.16
(TeX Live 2015) (preloaded format=pdflatex)
**
```
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The ‘**’ is \TeX{}’s way of asking you for an input filename. If you don’t want to type in the filename through standard input each time, provide the filename as the first argument.
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The ‘**’ is TeX’s way of asking you for an input filename. If you don’t want to type in the filename through standard input each time, provide the filename as the first argument.

To use TeX in a REPL like manner, type ‘\relax’ at the prompt for a filename. This is TeX’s NoOp command, in this case you are using it to tell TeX to expect nothing after an ‘\input’.
When you start `pdflatex`, you will see the following:

```
This is pdfTeX, Version 3.14159265-2.6-1.40.16
  (TeX Live 2015) (preloaded format=pdflatex)
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`pdflatex` will produce a PDF file.
The documentclass

When you start a document, you start it with a line that reads something like this:

```latex\documentclass{article}```
The documentclass

When you start a document, you start it with a line that reads something like this:

\documentclass{article}

There are actually many documentclasses to choose from:

- article
- minimal
- memior
- leaflet
- IEEEtran
- report
- letter
- beamer
- proc
- book
- exam
- ...
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\documentclass{article}

There are actually many documentclasses to choose from:

- article
- minimal
- memior
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- letter
- beamer
- proc
- book
- exam
- ...

You can also specify options like this:

\documentclass[12pt,a4paper,titlepage]{article}
Environments

\begin{itemize}
  \item An item
  \item Another item
\end{itemize}

\begin{environment}
  \begin{itemize}
    \item An item
    \item Another item
  \end{itemize}
\end{environment}

Environments

\begin{itemize}
  \item An item
  \item Another item
\end{itemize}

Output

- An item
- Another item
Environments

\begin{enumerate}
  \item An item
  \item Another item
\end{enumerate}

Output

1. An item
2. Another item
Use the `equation` environment for basic equation displays:

\begin{equation}
\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}
\end{equation}
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\begin{equation}
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\end{equation}

Output

\[
\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} \quad (2)
\]
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\begin{equation}
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\end{equation}

Output

\[
\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}
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Or use ‘$ ... $’ to quickly show math in a paragraph:

... we can see that as $x \to \infty$, the amount of ...
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\begin{equation}
\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}
\end{equation}

<table>
<thead>
<tr>
<th>Output</th>
</tr>
</thead>
</table>
| \[
\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} \tag{2}
\] |

Or use `$ ... $` to quickly show math in a paragraph:

... we can see that as $x \to \infty$, the amount of ...

<table>
<thead>
<tr>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>... we can see that as $x \to \infty$, the amount of ...</td>
</tr>
</tbody>
</table>
A \langle \text{return} \rangle \text{ is like a space}
A \langle \text{return} \rangle \text{ is like a space}

Two spaces in a row count as a single space
A \textlangle\textreturn\textrangle is like a space

Two spaces in a row count as a single space

A blank line denotes the end of a paragraph
How \TeX\ Reads What You Type

- A \langle\text{return}\rangle \text{ is like a space}
- Two spaces in a row count as a single space
- A blank line denotes the end of a paragraph

\TeX\ also categorizes your characters. There are 16 categories as follows:

<table>
<thead>
<tr>
<th>Cat</th>
<th>Meaning</th>
<th>Default</th>
<th>Cat</th>
<th>Meaning</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Escape character</td>
<td>\ \</td>
<td>8</td>
<td>Subscript</td>
<td>_</td>
</tr>
<tr>
<td>1</td>
<td>Begin group</td>
<td>{</td>
<td>9</td>
<td>Ignored character</td>
<td>\langle\text{null}\rangle</td>
</tr>
<tr>
<td>2</td>
<td>End group</td>
<td>}</td>
<td>10</td>
<td>Space</td>
<td>\langle\text{space}\rangle</td>
</tr>
<tr>
<td>3</td>
<td>Math shift</td>
<td>$</td>
<td>11</td>
<td>Letter</td>
<td>\text{A-Z,a-z}</td>
</tr>
<tr>
<td>4</td>
<td>Alignment tab</td>
<td>&amp;</td>
<td>12</td>
<td>Other character</td>
<td>~</td>
</tr>
<tr>
<td>5</td>
<td>End of line</td>
<td>\langle\text{return}\rangle</td>
<td>13</td>
<td>Active character</td>
<td>~</td>
</tr>
<tr>
<td>6</td>
<td>Parameter</td>
<td>#</td>
<td>14</td>
<td>Comment character</td>
<td>%</td>
</tr>
<tr>
<td>7</td>
<td>Superscript</td>
<td>^</td>
<td>15</td>
<td>Invalid character</td>
<td>\langle\text{delete}\rangle</td>
</tr>
</tbody>
</table>

Don’t worry too much about this. All this means is that you will have to escape a few special characters.


- \LaTeX{} has a badness value from 0 to 10,000, where 0 is perfect and 10,000 is infinitely bad, for almost everything in your document that is flexible.
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- When a line is perfect in spacing between words and no hyphenation, the badness will be zero.
TEX has a badness value from 0 to 10,000, where 0 is perfect and 10,000 is infinitely bad, for almost everything in your document that is flexible.

When a line is perfect in spacing between words and no hyphenation, the badness will be zero.

As words get too tight or too narrow, the badness increases.
TEX has a badness value from 0 to 10,000, where 0 is perfect and 10,000 is infinitely bad, for almost everything in your document that is flexible.

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As words get too tight or too narrow, the badness increases.

Hyphenation in words adds a lot of badness!
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When a line is perfect in spacing between words and no hyphenation, the badness will be zero.

As words get too tight or too narrow, the badness increases.

Hyphenation in words adds a lot of badness!

TEX then optimises the badness of each line, trying to get it as low as possible.
Sectioning

Use the commands:

\part{Part I} \textit{\% only in the book class}
\chapter{Awesome Chapter} \textit{\% only in book, report}
\section{Optimal Awesome}
\subsection{Here It Is}
Sectioning

Use the commands:

\part{Part I} % only in the book class
\chapter{Awesome Chapter} % only in book, report
\section{Optimal Awesome}
\subsection{Here It Is}

Then you can generate your table of contents using:

\tableofcontents
Graphics

In your preamble, include the \texttt{graphicx} package:

\usepackage{graphicx}

Then in your body: (arguments and file extension optional)

\includegraphics[width=4cm]{coolpix.png}
‘&’ acts as an alignment character in the `tabular` environment, ‘\’ acts as a newline:

\begin{tabular}{ |l|l| } 
  \hline 
  stuff \& stuff \ \hline 
  stuff \& stuff \ \hline 
  stuff \& stuff \ \hline 
\end{tabular}
‘&’ acts as an alignment character in the `tabular` environment, ‘\\’ acts as a newline:

\begin{tabular}{ |l|l| }
\hline
stuff & stuff \\ \hline
stuff & stuff \\ \hline
stuff & stuff \\
\hline
\end{tabular}

Output

<table>
<thead>
<tr>
<th>stuff</th>
<th>stuff</th>
</tr>
</thead>
<tbody>
<tr>
<td>stuff</td>
<td>stuff</td>
</tr>
</tbody>
</table>

Also take a look at the excellent `tabu` package.
‘&’ acts as an alignment character in the `tabular` environment, ‘\’ acts as a newline:

\begin{tabular}{ |l|l| }
  \hline
  stuff & stuff \\
  stuff & stuff \\
  stuff & stuff \\
  \hline
\end{tabular}

Output

<table>
<thead>
<tr>
<th>stuff</th>
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<tbody>
<tr>
<td>stuff</td>
<td>stuff</td>
</tr>
</tbody>
</table>

Also take a look at the excellent `tabu` package.
\begin{figure}
\centering
\includegraphics[width=4cm]{coolpix}
\caption{This is a really cool picture}
\end{figure}
Automagically Numbered Floating Figures and Tables

\begin{figure}
  \centering
  \includegraphics[width=4cm]{coolpix}
  \caption{This is a really cool picture}
\end{figure}

\begin{table}
  \centering
  \caption{Important Data About Stuff}
  \begin{tabular}{ | l | l | c | }
    \hline
    \end{tabular}
  ...
  \end{table}
\begin{figure}
\centering
\includegraphics[width=4cm]{coolpix}
\caption{This is a really cool picture}
\end{figure}

\begin{table}
\centering
\caption{Important Data About Stuff}
\begin{tabular}{ | l | l | c | }
\hline
... \\
\end{tabular}
\end{table}

You can also generate a List of Figures and a List of Tables:

\listoffigures
\listoftables
Use the \texttt{beamer} class, slides are in the \texttt{frame} environment.

\documentclass{beamer}
\begin{document}
\begin{frame}
\frametitle{Relevant Title}
Hello World!
\pause
% Advance slide to continue
This won’t show till you click.
\begin{block}{Cool Information}
This shows in a fancy blue block
\end{block}
\end{frame}
\end{document}
Hello World!
Hello World! This won’t show till you click.

**Cool Information**

This shows in a fancy blue block
Cool Tricks

Using \textit{TikZ}...
CTAN
is a great site that has all of the\n\TeX{} and \LaTeX{} packages and sources.
\url{http://ctan.org}
Resources and Recommended Reading

- The T\TeX\book, Donald E. Knuth
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- The \TeXbook, Donald E. Knuth
- \LaTeX: A Document Preparation System, Leslie Lamport
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- \TeX Users Group: http://tug.org

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Getting Help

A presentation in \LaTeX{} Beamer on \TeX{}/\LaTeX{}
You likely haven’t found a bug in \TeX. Knuth pays 0x$80.00 for every bug found in the current stable versions of \TeX and \Metafont.

- \TeX Stack Exchange
- \texttt{texhax} mailing list
- Come to LUG!