LaTeX for Beginners, An Interactive Introduction

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An interactive tutorial to typesetting with LaTeX is presented. The tutorial is aimed at JACoW editors with no previous experience with LaTeX. As we learn the basic LaTeX commands, users will be invited to get TeXing as we go along. A laptop with a browser is all that is required. We will use an online LaTeX tool (overleaf.com) for writing our first LaTeX document.

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LaTeX is neat, powerful, and cool!

- Created by mathematicians and scientists, for mathematicians and scientists
- Documents are written in plain text, with `commands` that determine its structure
- Text and commands are processed by latex to produce neatly formatted documents
- Extendable, numerous libraries with packages of extra commands and environments

Where to get help from

Plenty of online help resources, e.g.,

- www.sharelatex.com
- www.tug.org (TEX Users Group)
- ...

Hello JACoW!

```
\documentclass[10pt,a4paper]{article}
\begin{document}
Hello JACoW! %This is a comment
\end{document}
```

- A backslash \ signifies the start of a command
- `\documentclass` is the first LaTeX command
- The braces { } take a single argument which LaTeX uses for formatting. Standard formats are, e.g., `article`, `book`; customized formats are, e.g., `jacow`
- The square brackets [ ] embrace user supplied options. The above instructs LaTeX to typeset the document as an article, with 10pt base font size for printing on A4
- Text is entered between `\begin{document}` and `\end{document}`
- The percentage sign % starts a comment (which LaTeX ignores)

Error Handling

If during compilation, the compiler spits out an error, then:
DON'T PANIC!
Just read the first error message, which will also point you to the source of the error (line no.)
Correct the error and recompile.

Typesetting Text

```
\documentclass{article}

The space between \documentclass and \begin{document}
is referred to as the "preamble"

\begin{document}

Spaces     between words     do not matter
as they are collapsed     in the  output.

Paragraphs are separated by one or more blank lines
or by the command \par

Text can be typed in simply like this, using almost
any character such as * ( ? < > |
However, a few common characters have a special
meaning in LaTeX.

\end{document}
```

Special Characters

{ } % # & $ _

To make any of these characters appear in your text you will need to *escape* the character by preceding it with a backslash:

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

to get: { } % # & $ _

To make a backslash appear in the text, type \textbackslash

Title, Authors and Abstract

```
\documentclass{article}

%in "preamble" space
\title{My First \LaTeX~Paper}
\author{J. Trudeau}
\date{\today}

\begin{document}

\maketitle
\begin{abstract}
How to get started with the \LaTeX~text processing
package.
\end{abstract}

\end{document}
```

Sections, Subsections and Subsubsections

```
\documentclass{article}
\begin{document}

\section{Introduction}
An introduction to the \LaTeX~text processing packages
is presented.
\section{Methodology}
\subsection{Experimental Setup}
The experiment \ldots
\subsection{Data Analysis}
The data analysis \ldots
\subsubsection{Procedure}
Subsubsections are rarely used.
\section{Results}
\section{Conclusion}
\section{Acknowledgements}

\end{document}
```

Packages

LaTeX features numerous commands and environments. In addition to the built-in set, there are hundreds of others libraries with extra commands/environments made available through packages.
Packages are loaded in the preamble through \usepackage. Expect to load several more as your expertise grows and you want more refined control!
Example: graphicx package for the \includegraphics

Creating Specific Environments

`\begin`

and

`\end`

commands create a special environment or context.
Some examples are:

```
\begin{abstract}   \end{abstract}
\begin{itemize}    \end{itemize}
\begin{enumerate}  \end{enumerate}
\begin{equation}   \end{equation}
\begin{figure}     \end{figure}
\begin{table}      \end{table}
```

Itemize, Enumerate

```
Canadian national hockey league teams:
\begin{itemize} %bullet points
\item Vancouver Canucks
\item Toronto Maple Leafs
\item Montreal Canadians
\end{itemize}

\begin{enumerate} %numbered points
\item Edmonton Oilers
\item Ottawa Senators
\item Winnipeg Jets
\item Calgary Flames
\end{enumerate}
```

Figures

```
Requires package \usepackage{graphicx}
```

To reference a figure in the text, use the \ref{} command which makes reference to the respective figure labeled by \label{} as show below

```
Figure \ref{fig:frog} illustrates

\begin{figure}
\centering
\includegraphics[width=0.9\textwidth]{frog}
\label{fig:frog}
\caption{The FROG experimental setup.}
\end{figure}
```

Tables

```
tabular environment requires package:
  \usepackage{tabularx}
\SI{<number>}{<unit>} requires:
  \usepackage{siunitx}
To reference the table, use
Table~\ref{table:margin}
```

Tables ...

Table : Margin Specifications

Margin	**A4**	**US Letter**
Top	37 mm	0.75 in
Bottom	19 mm	0.75 in
Left	20 mm	0.79 in
Right	20 mm	1.02 in

Tables (cont.)

```
\begin{table}[hbt]
  \centering
  \caption{Margin Specifications}
  \begin{tabular}{lcc}
    \toprule
    \textbf{Margin} & \textbf{A4}
                    & \textbf{US Letter} \\
    \midrule
    Top    & \SI{37}{mm} & \SI{0.75}{in}  \\
    Bottom & \SI{19}{mm} & \SI{0.75}{in}  \\
    Left   & \SI{20}{mm} & \SI{0.79}{in}  \\
    Right  & \SI{20}{mm} & \SI{1.02}{in}  \\
    \bottomrule
  \end{tabular}
  \label{table:margin}
\end{table}
```

Typesetting Maths

Inline math mode: The maths is surrounded by single dollar signs. For example, $x^2 + y^2 = z^2$

```
$x^2 + y^2 = z^2$
```

The single dollar signs surrounding the mathematical expression cause TEX to enter and exit math mode.

Typesetting Maths cont.

Display math mode: The maths surrounded by escaped brackets

```
("\[" and "\]"),
```

For example:

$$x^2 + y^2 = z^2$$

is given by:

```
\[
x^2 + y^2 = z^2
\]
```

Basic Maths

Elementary maths, $a \le 6$,

```
$a \le 6$
```

Fraction, $\frac{3}{4}$

```
$\frac{3}{4}$
```

Square root, $\sqrt{2}$

```
$\sqrt{2}$
```

Superscripts and subscripts are indicated by carets and underscores:

```
(^) (_), e.g. $2^n$,  $x_1$,  $a^{x+y}$
```

which gives 2^n, x_1, a^{x+y}
Greek Letters, $\alpha, \beta, \gamma, \delta, \Delta$

```
$\alpha, \beta, \gamma, \delta, \Delta$
```

Basic Maths Cont.

Sums and Integrals, $\sum$, $\int$

```
$\sum$, $\int$
```

Functions, sin, cos,

```
$\sin$, $\cos$
```

$$\sin(x+y) = \sin x \cos y + \cos x \sin y$$

```
\[
\sin(x+y) = \sin x \cos y + \cos x \sin y
\]
```

Equations

$$f(\alpha, \beta) = \sqrt{(\alpha^2 + \beta^2)} \tag{1}$$

$$\sum_{n}^{(n+1)} = (\gamma_1^{(n+1)} + \gamma_2^{(n+1)}) \tag{2}$$

```
\begin{equation}
f(\alpha,\beta) = \sqrt{(\alpha^2 + \beta^2)}
\end{equation}

\begin{equation}
\sum_n^{(n+1)} =
     (\gamma_{1}^{(n+1)} + \gamma_{2}^{(n+1)})
\end{equation}

Use {equation*) to remove numbering
```

Aligning Equations

$$f(\alpha, \beta) = \sqrt{(\alpha^2 + \beta^2)} \tag{3}$$

$$\sum_{n}^{(n+1)} = (\gamma_1^{(n+1)} + \gamma_2^{(n+1)}) \tag{4}$$

```
\begin{align}
f(\alpha,\beta) & = \sqrt{(\alpha^2 + \beta^2)} \\
\sum_n^{(n+1)} & =
     (\gamma_{1}^{(n+1)} + \gamma_{2}^{(n+1)})
\end{align}

Use {align*) to remove numbering
```

References

A. Alpha, B. T. Beta, C. Gamma, and D. Delta, “An overview of control systems”, in *Proc. ICALEPCS'15*, Melbourne, Australia, Oct. 2015, pp. 89–91, doi:10.18429/JACoW-ICALEPCS2015-WEB3O04


```
Requires \usepackage{cite} \usepackage{url}

See Ref.~\cite{icalpecs11:alpha}

\begin{thebibliography}{9} %or {99} if > than 9 refs.
\bibitem{icalepcs11:alpha}
A.~Alpha, B.~T.~Beta, C.~Gamma, and D.~Delta,
``An overview of control systems'',
in \emph{Proc. ICALEPCS\textquotesingle 15},
Melbourne, Australia, Oct. 2015, pp. 89--91,
\url{doi:10.18429/JACoW-ICALEPCS2015-WEB3O04}
\end{thebibliography}
```

Fun Stuff

Ready-made coffee stains!

Let's get TEXing!

www.overleaf.com