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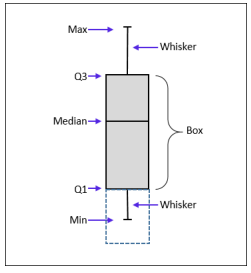
Workshop on "Document typesetting and Processing using LaTeX"

Session: Your first LaTeX document



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LaTeX Conventions I

Before we start with document, let us learn LaTeX conventions:
First with **characters**

\	escape character, LaTeX functions or control sequences start with this character, `\alpha, \section,\bf, etc.`
#	parameter character used in LaTeX macros
$	math shift character, i.e., $ character starts math mode and the next $ character stops it
%	comment character, LaTeX will ignore the characters after % till the end of that line
^	superscript character in math, e.g., `$a^2$` $= a^2$
_	superscript character in math, e.g., `$a_2$` $= a_2$
{	group open character used to open a local group
}	group open character used to close a local group
~	unbreakable space

LaTeX Conventions II

Alphabets and numerals

Alphabets and numerals other than what listed in the last slide are entered as in any other program or word processor.

Mathematical symbols and notations

Greek letters, various math operators including negated operators, arrows, stretchy delimiters, etc., are normally a coded as command. For e.g. for Greek alpha character we use \alpha to produce α.

To produce $\boxed{\alpha^2 + \beta^2 = 0}$ we use:

```
\begin{equation}
\alpha^2+\beta^2 = 0
\end{equation}
```

LaTeX Conventions III

More Mathematical symbols and notations

Similarly, a wide variety of symbols are accessed with names similar to what we ordinarily denote them. For instance, $\swarrow$, ψ, $\longrightarrow$, $\sum$, $\subseteq$, $\not\subseteq$ are generated with \swarrow, \psi, \longrightarrow, \sum, \subseteq, \not\subseteq.

Accented characters

Languages other than English have a variety of accents and special symbols. See this sentence:

El señor está bien, garçon, Él está aqüí

is generated by:

```
El se\~nor est\'a bien, gar\c{c}on, \'El est\'a aq\"u\'{\i}
```

The first LaTeX code I- The document format

Any LaTeX specifier (or Keyword, or function) consist of

KEYWORD[options in square bracket]{Argument in Braces}.

Let us start with out first LaTeX code and document.

The LaTeX document starts with PREAMBLE - the document format

The first Premable specifier : DOCUMENTCLASS with argument- usually ARTICLE, BOOK, REPORT, LETTER etc.

Standard format can be modified by- USEPACKAGE specifier.

```
% This is Preamble

\documentclass[a4paper, 11pt]
{article}
\usepackage{graphicx}
\usepackage{amsmath}
%amsmath is the package name
```

The first LaTeX code II- The front-matter

The Preamble is followed by the code \begin{document}, which is closed at the end of the document with \end{document}.

We start with '**front page specifiers**'.

We use specifiers e.g. \title{}, \author{}, \date{} etc.

The command \maketitle compiles the front-matters.

```
% These are front-matters

\title{Your title goes here}
\author{Auth1 \and Auth.2
 \\Affili.}
\date{\today}

\maketitle
```

The first LaTeX code III- The document body

As can be expected, the document body specifier are:

\begin{abstract} and ends with \end{abstract}- here abstract is called the **environment**.

Other specifier are: \keywords, \section{}, \subsection{}, \subsubsection{}, etc.

```
% These are front-matters

\begin{abstract}
Your abstract goes here.
\end{abstract}

\section{Introduction}
\subsection{Actual Problem}
\subsubsection{Case-Study}

\section{Experiment}
\section{Discussions}
\section{Conclusions}
```

The first LaTeX code V- The Lists Environment

Normally, **Acknowledgements**, **Appendices** and **References** make the end-matters. In LaTeX we specify them as:

Appendices and Acknowledgements can be coded as: \section{Acknowledgement} and \section{Appendices}.

For References we use **thebibliography** environment, as: \begin{thebibliography} and ends with \end{thebibliography}.

The actual references are then coded with specifier: \bibitem{ref. label}{ref. detail}

```
% These are end-matters

\section{Appendices}
\section*{Acknowledgements}
%*puts off the section number

\begin{thebibliography}{99}
\bibitem{Stump}{D. R. Stump,
 ``How to write a LaTeX
 paper'', 2000.}
\end{thebibliography}
```

The first LaTeX code V- The Lists Environment

Scientific documents normally contains **Lists, Figures, Tables, Equations (Maths & Chemistry) and References**. We will learn to include these in our document.

We start with the **Lists**.

Normally following two lists are used:

\begin{enumerate} list text \end{enumerate}

\begin{itemize} list text \end{itemize}

The list text is coded as \item.

.

```
\begin{enumerate}
\item The labels consists of sequential numbers.
\item The numbers starts at 1 with every call
 to the enumerate environment.
\end{enumerate}
```

The first LaTeX code V- The Lists

Quite often we use a list within a list, i.e. the nested list. These are very simple. We use both **itemize** and **enumerate** environments for our example.

1. The `itemize` label at the first level is a bullet.
   - The numbering is with Arabic numerals since this is ...
     1.a This is the third level of the nesting, but the ...
     1.b The label at this level is a long dash.
   - Every list should contain at least two points.
2. Blank lines ahead of an ...

```
\begin{enumerate}
\item The {\tt itemize} label at the first level is a bullet.
\begin{itemize}
\item The numbering is with Arabic numerals since this is ...
\begin{enumerate}
\item This is the third level of the nesting, but the ...
\item The label at this level is a long dash.
\end{enumerate}
\item Every list should contain at least two points.
\end{itemize}
\item Blank lines ahead of an ...\\
\vspace{0.2cm}
\end{enumerate}
```

The first LaTeX code VI- The Figure Environment

Figures are normally created in different software, e.g. MS Excel®, and then attached (pasted) to the document. This is similar in LaTeX.

CAPTION and **Figure Number** are part of figure in any scientific document. Eventually, it may be desired to obtain **Table of Figures**. In LaTeX entire work with figure is rather simple after we add in the preamble: \usepackage{graphicx}

To insert a figure the **figure** environment is used, as:

```
\begin{figure}[Position]
\includegraphics[Figure size]{fig1.jpg}
\caption{figure title}
\end{figure}
```

Let us learn the code in detail.

The first LaTeX code VII- The Figure Environment

First the figure environment

```
\begin{figure}[Position]
\end{figure}
```

The **POSITION** option specifies where in the page the figure should be attached- i.e. **h** - here, where the code is placed, **b** - at the **bottom** of the page, **t** - at the **top** of the page, **!** - for overriding the LaTeX internal code.

The **POSITION** can also be specified as a combination, e.g. **htb**.

```
\begin{figure}[h]
\end{figure}
```

The first LaTeX code VIII- The Figure Environment

Next we include the figure with

```
\includegraphics[Figure size]{fig1.jpg}
```

Several figure formats such as, **EPS, PDF, JPG, BMF, PNG** can be attached to the LaTeX document. These formats can be obtained from any standard mathematical analysis software.

The power of LaTeX is more on the **size and orientation** option of the \includegraphics specifier.

The option: **angle=xx**, where xx specifies angle in degrees- e.g. 45, 130 etc. can be used to rotate the figure.

The first LaTeX code IX- The Figure Environment

Figure sizing options are: **width=xx, height=xx, scale=xx, keep-aspectratio**, where 'xx' refers to dimension, e.g. 4cm, 10mm, 3in, 12pt etc. for the width and height, whereas it is a number for scale.

A combination of several options, e.g. [scale= 0.1, angle=123.4], can be used for the figure.

Lastly, we put caption using \caption{} specifier. Caption is place below the figure in the document, so we have to place caption specifier below the \includegraphics{} specifier.

The first LaTeX code X- The Figure Environment

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Figure 1: scale = 0.2

Figure 2: scale = 0.2, height= 0.3in, angle= 120

Figure 3: width= 5cm, angle= 180

Concluding Remarks

As stated, LaTeX is highly customizable, but for that we need to additional **packages** in our preamble. There are over 1000 packages available.

Normally the publishers provide their template which include all additional packages.

Some important packages, that you may check, are: **color, xcolor, subfigure, subcaption, float, easylist, amssymb, amsmath** .

You may check here for more: for Lists and for Figures, also here for Figures

Tables, equations . . .,

Next, improve our LaTeX document.