LaTeX for Newbies

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Chapter 1

Introduction

LaTeX is a typesetting program used widely in scientific community to prepare documents. It allows the user to typeset their content using tags and formatting commands. There are several features provided by this program, some of them are typesetting, cross-referencing, embedding tables and images inside documents, etc.

1.0.1 Why LaTeX?

A simple question one may ask that why we need yet another document preparation tool when we have so many of them like MS Word already available in the market. The answer to this is that LaTeX comes free of cost and the time it takes to prepare a large document is very less. Also using LaTeX enables you to have more finer control over the appearence of your document.

Chapter 2

Getting Started

There are some simple steps you need to follow in order to get started. It is assumed that you are trying to prepare your document on a linux system. The steps are:

1. Open an editor of your choice(Kile or Vim).
2. Write the following commands as shown in the figure 2.1
3. Save the file with a .tex extension.
4. Type the command pdflatex at your terminal.
5. A pdf will be generated in the same folder as your .tex file.

```
\documentclass{article}
\title{My Title}
\Author{My Name}
\begin{document}
 Hello world. This is my first document.
\end{document}
```

Figure 2.1: A Simple LaTeX Document

In the above example

`\documentclass, \begin, etc.`

are the commands and everything inside `{..}` are the arguments to the command. this document will cover brief description of the commands and their usage.

Chapter 3

Document Types

LaTeX documents starts with `\documentclass{class}` and end with `\end{document}`.
Some of the well known and widely used classes are as given in table below.

Table 3.1: Document class

Class	**Description**
article	for articles in scientific journals, presentations, short reports, program documentations,...
report	for longer reports containing several chapters, small books, thesis, ...
book	for real books
slides	for slides
letter	for writting letters.

Chapter 4

Inserting Pictures

To insert a picture in your document use `\begin{figure} and \end{figure}`. An example for this is shown below in figure4.1.

```
\documentclass{article}
\title{My Title}
\Author{My Name}
\begin{document}
 \begin{figure}
  \includegraphics[width=7cm, height=2cm]{screen/shot1}
    \caption{A screenshot}
 \end{figure}
\end{document}
```

Figure 4.1: Basic commands for figure

Also note that you should include the package `\usepackage{graphics}, \usepackage{graphicx}` at the beginning of your document.

Chapter 5

Working With Tables

If you want a table in your document then you need to use `\begin{tabular} and \end{tabular}` commands. A sample code is shown below in figure5.1.

```
\begin{tabular} {|c|l|}
\hline
{\bf Header1} & {\bf Header2} \\
\hline \hline A & Description1\\
\hline B & Description2 \\
\hline C & Description3 \\
\hline
\end{tabular}
```

Figure 5.1: Basic commands for table

Chapter 6

Working With List Of Items

The two most commonly used list items - Numbered List and Bulleted List can be created using LaTeX as shown below.

6.0.2 Numbered List

A numbered list can be created in LaTeX using the tags as-

```
\begin{enumerate}
\item SSC
\item HSC
\item Graduation
\item Post-Graduation
\item Doctorate
\item Post-Doctorate
\end{enumerate}
```

And the above command will give the ouput as shown below -

1. SSC
2. HSC
3. Graduation
4. Post-Graduation
5. Doctorate
6. Post-Doctorate

6.0.3 Bulleted List

A bulleted list can be created in LaTeX using the tags as-

```
\begin{itemize}
\item Hollywood
```

```
\item Bollywood
\item Tollywood
\item Kollywood
\end{itemize}
```

And the above command will give the ouput as shown below -

- Hollywood
- Bollywood
- Tollywood
- Kollywood

Chapter 7

Styling The Text

Some part of text can be formatted in special ways. Below are the few LaTeX commands used for the purpose.

`\textit{...}`	*italic*	Italicizes the text. These are used for emphasis
`\textsc{...}`	Small Cap	Used for Small Cap heading or may be used in text
`\textbf{...}`	**Bold Face**	Bold face are used in text for emphasis a word in text
`\textsf{...}`	Sans Serif	Required for Sans Serif font
`\texttt{...}`	`typewriter`	These are used when typewriter font is required
`\uline{...}`	Underlined Text	Underlining a piece of text is often used in many documents

However, note that you would need to use the package `\usepackage[normalem]{ulem}` in order to get the facility of underlining the text.

Chapter 8

Using Mathematical Functions

Mathematical formulae and equations can easily be typeset by using handful LaTeX commands.

8.1 In-Line Math Environment

Using in-line mathematical environment we can place short mathematical formulae within a running text using `$ ... $`. For example,

"The equation of a straight line is in the form of `$ax+by+c=0$` or in the form of `$y=mx+c$` or `$\frac{x}{a}+\frac{y}{b}=1$`"

will give the output as -

The equation of a straight line is in the form of $ax + by + c = 0$ or in the form of $y = mx + c$ or $\frac{x}{a} + \frac{y}{b} = 1$.

8.2 Display Math Environment

`displaymath` environment places space before and after the equation and b default displays them as centered. `displaymath` environment can be invoked using `$$ ... $$` as illustrated below.

"The roots of a quadratic equation `$ax^2 + bx + c = 0$` can be obtained using Sridhara-Acharya formula - `$$x=\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$`

will produce the output-

The roots of a quadratic equation $ax^2 + bx + c = 0$ can be obtained using Sridhara-Acharya formula -

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

8.3 Equation Environment

The `equation` environment is almost like the above `displayymath` environment except that each of the equation here are numbered using parenthesized equation number. This is invoked by `\begin{equation} ... \end{equation}`as shown below

A basic limit of sine function is-

```
\begin{equation}
\lim_{x \rightarrow 0}\frac{sin x}{x} = 1
\end{equation}
```

will produce the ouput-

A basic limit of sine function is-

$$\lim_{x \rightarrow 0}\frac{sinx}{x} = 1 \tag{8.1}$$

8.4 Eqnarray Environment

This is generaly used to build multiline formulae and every line of formula is numbered accordingly. To invoke `eqnarray` we use `\begin{eqnarray} ... \end{eqnnarray}`. This is illustrated below.

```
\begin{eqnarray}
\sum_{n=1}^{m} n &=& \frac{m\times(m + 1)}{2}  \\
\sum_{n=1}^{m} n^2 &=& \frac{m\times(m+1)\times(2m+1)}{6} \\
\sum_{n=1}^{m} n^3 &=& (\frac{m\times(m + 1)}{2})^2
\end{eqnarray}
```

will be producing the following output -

$$\sum_{n=1}^{m} n = \frac{m \times (m+1)}{2} \tag{8.2}$$

$$\sum_{n=1}^{m} n^2 = \frac{m \times (m+1) \times (2m+1)}{6} \tag{8.3}$$

$$\sum_{n=1}^{m} n^3 = \left(\frac{m \times (m+1)}{2}\right)^2 \tag{8.4}$$

8.5 Subscript and Superscript in Maths

Subscripts and superscripts can be made using the symbols `'_'` and `'^'` respectively. Below are some illustrative examples -

Using mathematical commands like -

```
$ 2^0 + 2^1 + 2^2 + ... + 2^n = 2^{n+1} - 1 $
```

```
$ {}_r^nP = {}_r^nC \times r! $
```

will produce the folllowing output

$2^0 + 2^1 + 2^2 + ... + 2^n = 2^{n+1} - 1$

${}_r^nP = {}_r^nC \times r!$

8.6 Propositional Logic and Sets

Symbols used in propositional logic can also be created using LaTeXcommand.

Some examples involving prositional logic formula are:

```
$ p \rightarrow q \equiv \neg p \vee \neg q $
```

```
$ \neg(p \wedge q) \equiv \neg p \vee \neg q $
```

```
$ (p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$
```

```
$ \neg \forall x P(x) \equiv \exists x \neg P(x) $
```

```
$ A \oplus B &=& (A \cup B)-(A \cap B) $
```

produces the output as follows -

$p \rightarrow q \equiv \neg p \vee \neg q$

$\neg(p \wedge q) \equiv \neg p \vee \neg q$

$(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$

$\neg \forall x P(x) \equiv \exists x \neg P(x)$

$A \oplus B = (A \cup B) - (A \cap B)$

Chapter 9

Working with Graphics

For embedding pictures and graphics in our documents LaTeX provides us with two packages - `graphics` and `graphicx`. These package need to be specified in the top of the document as

```
\usepackage{graphics}
\usepackage{graphicx}
```

These package provides us with an aditional command `\includegraphics[options]{name}` which allows us to provide the name of the graphic file as well as optional argument to change the width and height as well as scale the figure.

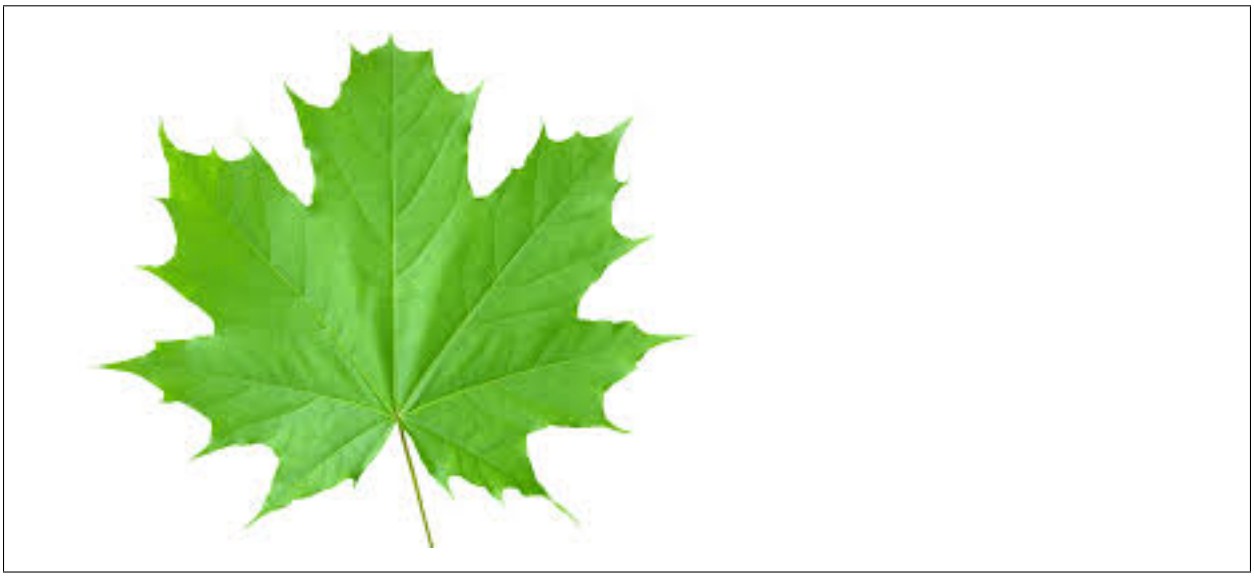
for eg. given below are four instances of the same picture adjusted to different heights,widths and scale.

```
\includegraphics[width=4cm, height=4cm]{screen/images.jpg} -
```

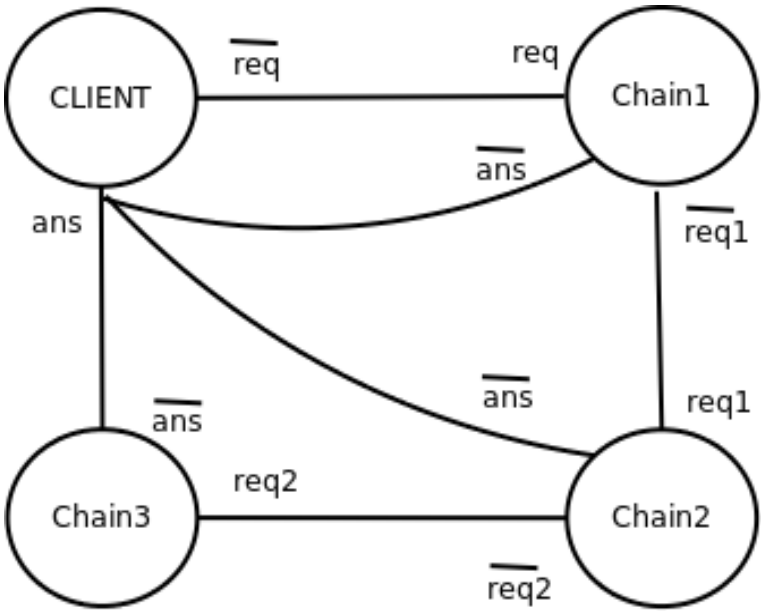
```
\includegraphics[width=6cm, height=6cm]{screen/images.jpg} -
```

```
\includegraphics[scale=0.5]{screen/images.jpg} -
```

```
\includegraphics[scale=1]{screen/images.jpg} -
```



We can also embed network flow diagram and parse trees drawn using some third party software like dia and then embedding the same into or LaTeX document. For example I have drawn a workflow using dia and I embed it here



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