

Here is a list of tips to make your LaTeX projects more modular, readable, and maintainable:

- A latex page often have - Lists, Tables, Images. Create seprate tex files for them and use input command to include then in the page.
- **Use subfiles** to divide the content into separate files, allowing independent compilation of chapters or sections. Use \input or \include to separate sections or chapters into different files for better structure.
- **Define reusable variables and commands** with \newcommand or \def to keep your code cleaner and avoid repetition.
- **Use \begingroup and \endgroup** to limit the scope of variables or formatting changes, which are automatically destroyed after use. Use a group to safely define macros in one subfile and use them in another, without polluting the global scope. For example:

```
\begingroup
    \input{\subfix{cat.tex}}    % defines macros (e.g., \myVar)
    \input{\subfix{apple.tex}} % uses \myVar
\endgroup
```

This ensures macros like \myVar do not affect other parts of the document.

- **Create custom environments** with NewDocumentEnvironment to define consistent styles or formatting for repeated structures.
- **Organize packages and settings** in a separate preamble file or style file (.sty) to avoid cluttering the main document.
- **Comment generously** and maintain a changelog for collaborative projects or long-term maintenance.
- **Use bibliographies modularly** with BibTeX or BibLaTeX in separate files for easier management of references.
- **Avoid hard-coded formatting** in the main document; define styles and colors globally using commands or custom environments.
- **Use consistent naming conventions** for labels, commands, and files to reduce confusion and improve readability.
- **Test small sections independently** before compiling the whole document to quickly catch errors.

Tips while writing latex code

- Avoid \begin{center} around floats — use \centering.

- `\centering` centers content inside the float.
- Always add `\caption{}` inside the table if you want it to appear in the List of Tables.
- Use `\label{}` after `\caption{}` to reference the table in text.
- `[h!]` → “try to place here as much as possible”.

# Chapter 1

## Tables in LATEX

### 1.1 Simple Table With Variables

|       |       |
|-------|-------|
| Apple | Fruit |
|-------|-------|

Table 1.1: Simple table

```
% usepackage : [table]{xcolor}, float(h!), caption
\begin{group}
% Define variables(macros) for table using \def or \newcommand
\def\cellOneA{\textbf{Apple}}
\def\cellOneB{\textcolor{red}{Fruit}}
\setlength{\tabcolsep}{10pt}
% Now use these variables inside a table
\begin{center}
\renewcommand{\arraystretch}{1.2}
\begin{tabular}{|c|c|}
\hline
\cellOneA & \cellOneB \\
\hline
\end{tabular}
\begin{table} [!h]
\caption{Simple table}
\end{table}
\end{center}
\medskip
\end{group} % After \endgroup, macros \cellOneA etc. are no longer defined.
```

## 1.2 Simple Table using centering without begin(center)

|        |       |
|--------|-------|
| Fruit  | Apple |
| Animal | Cat   |

Table 1.2: Table with environment

Code:

```
\begin{simpleCenteringTempChapterTable}{Table with environment}
  \def\cellOneA{\textbf{Fruit}}
  \def\cellOneB{\textcolor{red}{Apple}}
  \def\cellTwoA{\textbf{Animal}}
  \def\cellTwoB{\textcolor{orange}{Cat}}

  \begin{tabular}{|c|c|} \hline
    \cellOneA & \cellOneB \\ \hline
    \cellTwoA & \cellTwoB \\ \hline
  \end{tabular}
\end{simpleCenteringTempChapterTable}
```

Listing 1.1: Simple Table Example

```
\NewDocumentEnvironment{simpleCenteringTempChapterTable}[1] % #1 = caption
{%
  \begingroup % <-- start local scope
  \begin{table}[%]
    \centering
    \setlength{\tabcolsep}{10pt}
    \renewcommand{\arraystretch}{1.4}
  \caption{#1}
  \end{table}
  \endgroup % <-- end local scope (cleans variables)
}
```

Listing 1.2: Simple Table Example

## 1.3 Custom Tables

| Description(c)         | Content(c)     | Tag Used(p)          |
|------------------------|----------------|----------------------|
| Table Cell with 2 rows | Apple<br>Mango | makecell, \\         |
| Table Cell with 2 rows | newline col c  | newline<br>col p     |
| A multi row<br>cell    | Eagle          | multirow, cline      |
|                        | Parrot         | 6em or *             |
| Multi column cell      |                | multicolumn, l, c, r |

Table 1.3: Customizing The Cells

```
% \makecell[l]{\textcolor{red}{Apple} \\ \textcolor{green}{Mango}}
```

```
% \multirow{2}{6em}{Birds} & Eagle & Apple \\ \cline{2-3}
% & Parrot & Banana \\ \hline
```

```
% \multicolumn{2}{l}{Multi column cell} & Apple \\ \hline
```

## 1.4 Not recommended : Table Using begin{center}.

|        |       |
|--------|-------|
| Fruit  | Apple |
| Animal | Cat   |

Table 1.4: Table with environment

Code:

```
\begin{simpleTableEnvTempChapterTable}{Table with environment}
\def\cellOneA{\textbf{Fruit}}
\def\cellOneB{\textcolor{red}{Apple}}
\def\cellTwoA{\textbf{Animal}}
\def\cellTwoB{\textcolor{orange}{Cat}}

\begin{tabular}{|c|c|} \hline
\cellOneA & \cellOneB \\ \hline
\cellTwoA & \cellTwoB \\ \hline
\end{tabular}

\end{simpleTableEnvTempChapterTable}
```

Listing 1.3: Simple Table Example

```
\NewDocumentEnvironment{simpleTableEnvTempChapterTable}[1]
{
  \begingroup
  \setlength{\tabcolsep}{10pt}
  \begin{center}
  \renewcommand{\arraystretch}{1.2}
  \begin{table}![h]
    \caption{#1}
  \end{table}
  \end{center}
  \endgroup
}
```

Listing 1.4: Simple Table Example

# Chapter 2

## Lists in LATEX

### 2.1 Lists in LaTeX

#### 2.1.1 Basic lists

Basic unordered list:

- Apple
- Orange

Basic ordered list:

1. Apple
2. Orange

```
% usepackage : enumitem
\noindent Basic unordered list:
\par
\begin{itemize}[nosep] % nosep(no extra vertical space)
  \item Apple
  \item Orange
\end{itemize}

\noindent Basic ordered list:
\par
\begin{enumerate}
  \item Apple
  \item Orange
\end{enumerate}
```

### 2.1.2 Basic lists

Description list:

```
XX Apple
AAA Orange
```

```
% usepackage : enumitem
\noindent Description list:
\par
\begin{description}[itemsep=0pt,parsep=0pt] % itemsep and parsep
    \item[XX] Apple
    \item[AAA] Orange
\end{description}
```

### 2.1.3 Wide lists

Wide list for paragraph-like items:

- This item demonstrates wide layout so that wrapped lines align with the text block instead of being indented.
- Another wide item to illustrate multi-line behavior with compact spacing.

```
% chapters/chap03-lists/example_codes/wide_lists_example.tex
% Wide lists: labels align with paragraph, subsequent lines unindented
\noindent Wide list for paragraph-like items:
\par
\begin{itemize}[wide,nosep]
    \item This item demonstrates wide layout so that wrapped lines align with the text
        ↪ block instead of being indented.
    \item Another wide item to illustrate multi-line behavior with compact spacing.
\end{itemize}
```

### 2.1.4 Nested lists

Nested lists:

- Outer A
- Outer B
  - Inner B.1
  - Inner B.2
    - 1. Numbered subpoint 1
    - 2. Numbered subpoint 2
- Outer C

```
% usepackage : enumitem
\noindent Nested lists:
\par
\begin{itemize}
    \item Outer A
    \item Outer B
    \begin{itemize}
        \item Inner B.1
        \item Inner B.2
        \begin{enumerate}
            \item Numbered subpoint 1
            \item Numbered subpoint 2
        \end{enumerate}
    \end{itemize}
\end{itemize}
\item Outer C
\end{itemize}
```

### 2.1.5 Custom labels and refs

Custom-labeled enumerate/ref. See Q2, and Q3 [uses ref= to mirror labels].

Q1. What is your name?

Q2. What is your quest?

Q3. What is your favorite color?

In-paragraph list (manual punctuation), useful for compact text:

- (a) apples,
- (b) bananas,
- (c) cherries,
- (d) dates.

```
% usepackage : enumitem
\noindent Custom-labeled enumerate/ref. See \ref{itm:q2}, and \ref{itm:q3} [uses ref= to
→ mirror labels].
\par
\begin{enumerate}[label=\arabic*,ref=\arabic*]
    \item\label{itm:q1} What is your name?
    \item\label{itm:q2} What is your quest?
    \item\label{itm:q3} What is your favorite color?
\end{enumerate}

\noindent In-paragraph list (manual punctuation), useful for compact text:
\par
\begin{enumerate}[label=(\alph*),nosep]
    \item apples, \item bananas, \item cherries, \item dates.
\end{enumerate}
```

# Chapter 3

## Figures in LATEX

### 3.1 Environment For Using Figures

```
% usepackage : xparsenewDocumentEnvironment, graphicx(includegraphics), float(h!),
  ↪ subfiles(subfix), caption
\NewDocumentEnvironment{simpleImage}{ m m o o }
{
  \begin{figure}[h!]
    \centering
    \includegraphics[width=#2]{#1}
    \IfValueTF{#3}{\caption{#3}}{}
    \IfValueTF{#4}{\label{#4}}{}
  \end{figure}
}

\begin{simpleImage}
  {\subfix{example_codes/img_02.jpg}}
  {0.6\linewidth}
  [A simple example image]
  [fig:simple_image]      % use [] to provide empty values
\end{simpleImage}
```

```
% 2 mandatory, 2 optional args
% #1=image, #2=width, #3=caption, #4=label
% m(mandatory), o(optional []), O(default{}), s(starred version)
```

## 3.2 Environment For Box Figures and List figures

```
% usepackage : xparse(NewDocumentEnvironment), graphicx(includegraphics), subfiles(
    ↪ subfix), caption
\NewDocumentEnvironment{centerBoxImageStyle}{ m m m m m }
{
\begin{center}
\fbox{%
\begin{minipage}{#2}
\centering
\includegraphics[width=#3]{#1}
\captionof{figure}{#4}
\label{#5}
\end{minipage}
}
\end{center}
}{}%
\begin{comment}
```

```
\begin{centerBoxImageStyle}
{\subfix{example_codes/img_02.jpg}}      % #1 image path
{0.6\linewidth}                         % #2 minipage width (box width)
{0.9\linewidth}                         % #3 image width inside box
{A simple example image inside a box.}   % #4 caption
{}                                       % #5 label
\end{centerBoxImageStyle}
\end{comment}
% m(mandatory), o(optional []), O({default}), s(starred version)
```

### 3.3 Simple Figures

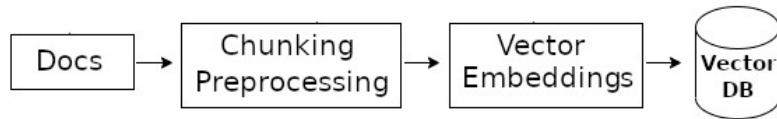


Figure 3.1: A simple example image.

```
% usepackage : graphicx(includegraphics), float(h!), subfiles(subfix), caption
\begin{figure}[h!]
    \centering
    \includegraphics[width=0.6\linewidth]{\subfix{example_codes/img_02.jpg}}
    \caption{A simple example image.}
    \label{fig:simple_image}
\end{figure}
```

### 3.4 Figures in Box, keep in list

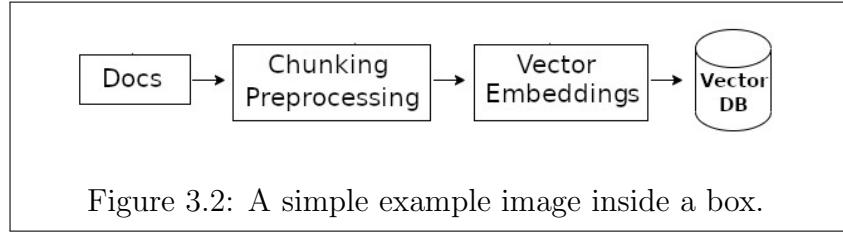


Figure 3.2: A simple example image inside a box.

```
% usepackage : graphicx(includegraphics), float(h!), subfiles(subfix), caption
\begin{center} % Boxed image
\fbox{%
\begin{minipage}{0.6\linewidth}
    \centering
    \includegraphics[width=0.9\linewidth]{\subfix{example_codes/img_02.jpg}}
    \captionof{figure}{A simple example image inside a box.}
    \label{fig:simple_boxed_image}
\end{minipage}
}
\end{center}
```

### 3.5 Importatnt Points to add Figures

- Create environment(template) which take arguments and display image.
- Create a seprate tex file that will use the template to display image.
- Import the tex file create in above step to your main code.

# Chapter 4

## Variables in LATEX

Variables are destroyed after endgroup. (begingroup - endgroup)

### 4.1 Simple Text Variables in tables

|        |           |
|--------|-----------|
| Apple  | Fruit     |
| Carrot | Vegetable |

```
\begingroup
% Define "variables" (macros) for table cells using \def or \newcommand
\def\cellOneA{\textbf{Apple}}
\def\cellOneB{\textcolor{red}{Fruit}}
\def\cellTwoA{\textbf{Carrot}}
\def\cellTwoB{\textcolor{orange}{Vegetable}}

% Now use these variables inside a table
\begin{center}
\begin{tabular}{|c|c|}
\hline
\cellOneA & \cellOneB \\ \hline
\cellTwoA & \cellTwoB \\ \hline
\end{tabular}
\end{center}
\medskip
% After \endgroup, macros \cellA, \cellB, etc. are no longer defined.
\endgroup
```

## 4.2 Simple Text Variables

Text Variable.

```
\newcommand{\varText}{\textbf{Text Variable}.}
```

## 4.3 Simple Maths Variables

$$E = mc^2$$

```
\def\varMath{$E = mc^2$} \varMath
```

## 4.4 Simple tikz image Variables



Figure 4.1: Stored Figure

```
\begingroup
\newsavebox{\figBox}
\begin{lrbox}{\figBox}
\begin{tikzpicture}[scale=0.8]
\draw[fill=orange!40] (2.5,0) rectangle (3.5,1);
\node at (3,0.5) {Box};
\end{tikzpicture}
\end{lrbox}

\begin{figure}[h]
\centering
\usebox{\figBox}
\caption{Stored Figure}
\end{figure}
\bigskip
\endgroup
```

## 4.5 Simple Table Variables

| Fruit | Color |
|-------|-------|
| Apple | Red   |

Stored Figure

```
\begingroup
  \newsavebox{\tableBox}
  \begin{lrbox}{\tableBox}
    \begin{tabular}{|c|c|} \hline
      \textbf{Fruit} & \textbf{Color} \\ \hline
      Apple & Red \\ \hline
    \end{tabular}
  \end{lrbox}

  \begin{center}
    \usebox{\tableBox}\vspace{[3pt]}
    \textbf{Stored Figure}
  \end{center}
\endgroup
```

## 4.6 Dynamic content variable using newtoks

This is *stored* in a token register.

```
\begingroup
  \newtoks\varTokens
  \varTokens={This is \textit{stored} in a token register.}
  \the\varTokens
\endgroup
```

## 4.7 Temporary macros (auto-destroyed after scope)

Scoped variable A

```
\begingroup
  \def\tempA{Scoped \textbf{variable A}}
  \medskip
  \noindent \tempA
\endgroup
```