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
\begingroup
    % 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
\endgroup % 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}{m} % #1 = caption
{%
  \begingroup                          % <--- start local scope
  \begin{table}[!h]
    \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 Mango	makecell, \\
Table Cell with 2 rows	newlinecol c	newline col p
A multi row 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}{m}
{
    \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}
  \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=Q\arabic*.,ref=Q\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 : xparse(NewDocumentEnvironment), 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

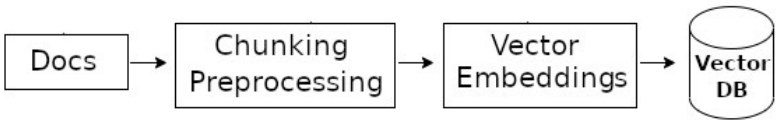

Figure 3.1: A simple example image.

```
% 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

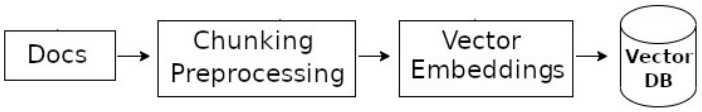

Figure 3.2: A simple example image inside a box.

```
% 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}\\[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
```