



## Basic Document Structure

### Document Setup

<code>\documentclass{article}</code> - Specifies the document class (e.g., article, report, book).
Options:
<ul style="list-style-type: none"> <li><code>10pt</code>, <code>11pt</code>, <code>12pt</code> - Font size.</li> <li><code>letterpaper</code>, <code>a4paper</code> - Paper size.</li> <li><code>twocolumn</code> - Two-column layout.</li> </ul>
<code>\usepackage{package_name}</code> - Includes a package for extended functionality (e.g., <code>amsmath</code> , <code>graphicx</code> ).
<code>\title{Document Title}</code> - Sets the document title.
<code>\author{Your Name}</code> - Sets the document author.
<code>\date{Date}</code> - Sets the document date. Use <code>\date{}</code> for no date.
<code>\begin{document}</code> - Begins the document environment.
<code>\maketitle</code> - Generates the title.
<code>\end{document}</code> - Ends the document environment.

### Text Formatting

#### Font Styles

<code>\textbf{text}</code>	Bold text.
<code>\textit{text}</code>	Italic text.
<code>\underline{text}</code>	Underlined text.
<code>\texttt{text}</code>	Typewriter text (monospace).
<code>\textsc{text}</code>	Small caps.
<code>\emph{text}</code>	Emphasis (usually italic).
<code>\textnormal{text}</code>	Normal font style.

## Math Mode

### Inline Math

<code>\$ ... \$</code> - Inline math mode.
<b>Example:</b> The equation $y = mx + b$ represents a line.
<code>\( ... \)</code> - Another way to denote inline math mode.
<b>Example:</b> The formula ( $E = mc^2$ ) is famous.

### Sectioning

<code>\section{Section Title}</code> - Creates a section.
<code>\subsection{Subsection Title}</code> - Creates a subsection.
<code>\subsubsection{Subsubsection Title}</code> - Creates a subsubsection.
<code>\paragraph{Paragraph Title}</code> - Creates a paragraph.
<code>\subparagraph{Subparagraph Title}</code> - Creates a subparagraph.

### Lists

<pre>\begin{itemize}   \item Item 1   \item Item 2 \end{itemize}</pre>
Unordered list.
<pre>\begin{enumerate}   \item Item 1   \item Item 2 \end{enumerate}</pre>
Ordered list.
<pre>\begin{description}   \item[Term 1] Definition 1   \item[Term 2] Definition 2 \end{description}</pre>
Description list.

## Display Math

`\[ ... \]` - Display math mode (equation on a separate line).

### Example:

```
[ \int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi} ]
```

`\begin{equation} ... \end{equation}` - Numbered equation.

### Example:

```
\begin{equation}
x^2 + y^2 = r^2
\end{equation}
```

`\begin{align} ... \end{align}` - Align multiple equations (requires `amsmath` package).

### Example:

```
\begin{align}
a &= b + c \\
d &= e + f
\end{align}
```

`\begin{gather} ... \end{gather}` - Use gather environment to group equations without alignment.

### Example:

```
\begin{gather}
a = b + c \\
d = e + f
\end{gather}
```

## Math Symbols

<code>\alpha, \beta, \gamma, \delta</code>	Greek letters.
<code>\mu, \times, \div</code>	Math operators.
<code>\leq, \geq, \neq</code>	Inequality symbols.
<code>\infty, \nabla, \partial</code>	Other symbols.
<code>\sum, \int, \lim</code>	Summation, integral, limit.
<code>\frac{num}{den}</code>	Fraction.
<code>\sqrt{x}</code>	Square root.
<code>x^y</code>	Superscript.
<code>x_y</code>	Subscript.

## Figures and Tables

### Figures

```
\begin{figure}[h!]
\centering
\includegraphics[width=0.8\textwidth]{image.jpg}
\caption{Figure caption}
\label{fig:my_label}
\end{figure}
```

Includes an image. Requires the `graphicx` package.

Options for `figure` environment:

- `h` - Place here.
- `t` - Place at the top of the page.
- `b` - Place at the bottom of the page.
- `p` - Place on a separate page.

### Tables

```
\begin{table}[h!]
\centering
\begin{tabular}{|c|c|c|}
\hline
Header 1 & Header 2 & Header 3 \\
\hline
Cell 1 & Cell 2 & Cell 3 \\
Cell 4 & Cell 5 & Cell 6 \\
\hline
\end{tabular}
\caption{Table caption}
\label{tab:my_label}
\end{table}
```

Creates a table.

Column specifiers in `tabular` environment:

- `c` - Centered.
- `l` - Left-aligned.
- `r` - Right-aligned.
- `|` - Vertical line.

`\hline` - Horizontal line.

`\multicolumn{cols}{align}{text}` - Cell spanning multiple columns.