# Formatting Texts II

The basic formatting of a document is discussed in detail in Hour 3. Some advanced formatting, including default as well as user-defined settings, are discussed in this Hour, like foot note, multiple columns, mini page, marginal note, modified sectional unit, etc.

4.1 Increasing Depth of Sectional Units*

As mentioned in §3.1 on page 15, LATEX assigns a three-tier serial numbers to the sectional units, which are **\chapter{}**, **\section{}**, and **\subsection{}** in the document-class **book** or **report**, and **\section{}**, **\subsection{}**, and **\subsubsection{}** in the document-class **article** (the document-class **letter** does not support any sectional unit command). Additionally, the **\part{}** command can be used in the document-class **book**, **report**, and **article** for dividing a document into parts. In the document-class **book** or **report**, the levels of **\part{}**, **\chapter{}**, **\section{}**, and **\subsection{}** commands are –1, 0, 1, and 2 respectively, while those of the **\part{}**, **\section{}**, **\subsection{}**, and **\subsubsection{}** commands in the document-class **article** are 0, 1, 2, and 3 respectively. In order to numbering a few more or less levels, the **\addtocounter{}{}** or **\setcounter{secnumdepth}{}** command may be used in the preamble, e.g., **\addtocounter{secnumdepth}{1}** will increase the numbering one level ahead or **\setcounter{secnumdepth}{5}** will extend the numbering up to the **\subparagraph{}** command. Figure 4.1 shows how the numbering up to the **\subparagraph{}** command
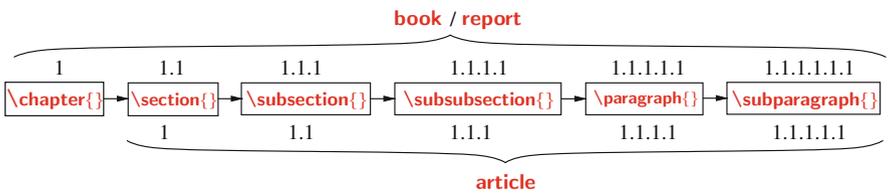
Fig. 4.1 Increasing depth of sectional units

would be when **\setcounter{secnumdepth}**{5} is used. If a particular sectional unit is not to be numbered, commands like **\chapter*{}**, **\section*{}** or **\subsection*{}** may be used. On the other hand, if none of the sectional units is to be numbered, instead of using a starred command every time, simply the **\setcounter{secnumdepth}{}** command may be used with a negative argument, e.g., **\setcounter{secnumdepth}**{-6}.

4.2   Changing Titles and Counters of Sectional Units*

LaTeX prints sectional units in certain standard patterns. The serial number (in an Arabic numeral) of a chapter is preceded by the label-word 'Chapter', while those of others by none. Some existing commands can be redefined to change these standard patterns. Such an example is shown in Table 4.1. The first **\renewcommand{}{}**

Table 4.1 Changing titles of sectional units

LaTeX input	**\documentclass{book}** **%** **\renewcommand{\chaptername}**{Unit} **\renewcommand{\thechapter}**{**\Alph{chapter}**} **\renewcommand{\thesection}**{**\S**~**\thechapter**.**arabic{section}**} **\renewcommand{\thesubsection}**{**\thesection**.**\arabic{subsection}**} **%** **\begin{document}** **\chapter{**Changed Headings**}** **\section{**New form of Section**}** … **\subsection{**New form of Sub-section also**}** … **\end{document}**
Output	**Unit A** **Changed Headings** **§ A.1 New form of Section** … **§ A.1.1 New form of Sub-section also** …

command in the preamble redefines the **\chaptername** command to Unit (as done in this book to Hour), i.e., the label-word of a chapter is changed from Chapter to Unit (the argument may be left empty if no label-word is required). The second **\renewcommand{}{}** command redefines the **\thechapter** command to **\Alph{chapter}** to print the serial number of a chapter by an uppercase alphabet[1]. On the other hand, the third **\renewcommand{}{}** command is used to redefine the **\thesection** command

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[1]The default printing styles of sectional units can be altered by redefining some commands, such as **\chaptername**, **\thechapter**, **\thesection**, **\thesubsection**, and **\thesubsubsection**.

to **\S~\thechapter.\arabic{section}**, where the **\thesection** command controls the numbering of sections. The **\S** command makes the serial number of a section to be preceded by the symbol § with a trailing blank space (due to the following ∼ symbol). The serial number is generated through the **\thechapter.\arabic{section}** command, where the **\thechapter** command gives the serial number of the chapter under which the section belongs, followed by a full-stop mark (due to **.** symbol), and then the **\arabic{section}** command prints the serial number of the section by an Arabic numeral. The last **\renewcommand{}{}** command redefines the **\thesubsection** command to **\thesection.\arabic{subsection}** for numbering a subsection in an Arabic numeral, preceded by the number of its section (through the **\thesection** command) and a full-stop mark (due to **.** symbol). Similarly, the default numbering style of other sectional units can also be altered. The other available commands for altering the serial numbers of sectional units include **\alph{}** for numbering in lowercase alphabets, and **\Roman{}** and **\roman{}** for numbering, respectively, in upper and lower Roman numerals.

On the other hand, each type of sectional unit is numbered serially starting from unity. This standard numbering can be changed to start from any intermediate integer through the **\setcounter{**asec**}{**n**}** command, where asec is the name of the sectional unit like **chapter** or **section**, and n is the starting counter of the sectional unit (default value of n is 0), which is incremented by 1 each time the sectional command is used[2]. For example, **\setcounter{chapter}{**3**}** will start the chapter numbering from 4.

4.3 Multiple Columns

The document-classes **article**, **book**, and **report** produce a document in single columns under the default option **onecolumn**. Still they permit to use the **twocolumn** option to **\documentclass[]{}** for producing a document in two columns. If required, some portion of a two-column document can also be produced in a single column by writing that portion in **[]** of the **\twocolumn[]** command (detail is in §19.2.4 on page 187). However, **\twocolumn[]** prints each single-column part on a new page even if sufficient blank space is left on the previous page of the document. Therefore, it is not a good practice to mix up both the options in a single document, except the cases as shown in Table 19.10 on page 188, where the single-column mode is used for printing the abstract of an article in a single column.
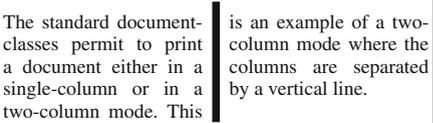
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[2]The default starting of numbering of a sectional unit from unity can be altered to start from the intermediate number n+1 by inserting **\setcounter{**asec**}{**n**}**, where asec is the name of the sectional unit like **chapter** or **section**.

4.3.1   Multiple Columns Related Parameters

The visual appearance of a multi-column document may be controlled by the
\columnsep, **\columnseprule** and **\columnwidth** commands. The **\columnsep** command
specifies the gap between two columns, while **\columnseprule** specifies the width of
the vertical line separating two columns. On the other hand, **\columnwidth** governs
the width of a column and its value is automatically calculated from the values of
\columnsep and **\textwidth**.

   The default value of **\columnseprule** is set as zero to make the vertical line invisible,
while the value of **\columnsep** varies with the used document-class and font size (detail
is in §5.1.1 on page 37). Their default effects can be altered by assigning them
new values in the same way as shown in Table 5.3 on page 40 for page formatting
commands. Table 4.2 shows an example of a two-column document, where a vertical
line is generated between the columns by assigning a value of 1 mm to **\columnseprule**.

Table 4.2   Two columns separated by a vertical line through the **\columnseprule** command

LATEX input	Output	
\documentclass[twocolumn]{article} **\columnseprule** = 1**mm** **%** **\begin{document}** The standard document-classes permit to print a document either in a ... **\end{document}**	The standard document-classes permit to print a document either in a single-column or in a two-column mode. This	is an example of a two-column mode where the columns are separated by a vertical line.

4.3.2   A Flexible Approach to Generate Multiple Columns

The standard LATEX can produce a document in a maximum of two columns through
the **twocolumn** option to the **\documentclass[]{}** command. Moreover, although the
\twocolumn[] command can produce a portion of a two-column document in a sin-
gle column, each single column is printed on a separate page. On the other hand,
the columns on the last page are not balanced. To overcome such problems, the
multicols environment, defined in the **multicol** package, can be used, which has the
capability of producing any number of columns (up to ten) even on a single-column
page[3]. Moreover, it can be applied inside other environments, like **minipage** (detail is
in §4.4 on the following page). Table 4.3 on the facing page shows an application

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[3]The **multicols** environment, defined in the **multicol** package, can be used for producing any
number of columns (up to ten) even on a single-column page.

Table 4.3 Multiple columns generated through the **multicols** environment

LaTeX input	Output

`\documentclass[11pt,a4paper]{article}`
`\usepackage{multicol}`
`\columnseprule = 0.5mm`
`%`
`\begin{document}`
`This is an example where a ...`
`%`
`\begin{multicols}{3}`
`This is a three-column paragraph. ...`
`\end{multicols}`
`%`
`In this example, all the three ...`
`\end{document}`
	This is an example where a paragraph is written in three columns. The paragraphs above and below it are written in single columns.
	
	This is a three-column paragraph. The gap between two columns are filled by a vertical line of 0.5 mm width.
	
	In this example, all the three paragraphs are produced on the same page.

of the **multicols** environment, where three columns on a single-column document are generated through the mandatory argument of the environment. Moreover, two adjacent columns are separated by a vertical line of 0.5 mm width through **\columnseprule**. Because of the default full alignment of texts, excess blank space can be seen in the columns in Table 4.3. In order to avoid such excess blank space, texts may be made left aligned using **\raggedright**, which is to be inserted just after the **\begin{multicols}**{3} command.

In Table 4.3, the multi-column portion was shown preceded by a single-column paragraph. Instead of inserting in that way, it can also be inserted as an optional argument to the **multicols** environment as **\begin{multicols}**{3}**[apref]**, where `apref` is the piece of texts to precede the multi-column portion.

The columns under the **multicols** environment can be customized through **\columnsep** and **\multicolsep**. The **\columnsep** command specifies the gap between two columns, while **\multicolsep** controls the vertical gap before and after the environment. The default values of **\columnsep** and **\multicolsep** in this environment are around 3.5 mm and 4.5 mm, respectively. The commands can be assigned other values in the same way as shown in Table 5.3 on page 40 for page formatting commands. On the other hand, the width of a column is calculated from the number of columns to be generated and the current value of **\linewidth**. The **\linewidth** command specifies the width of the current lines of texts, whose value is usually the same with that of **\textwidth** (detail is in §5.1.2 on page 38), but may vary inside some environments like **quotation** (refer §3.4 on page 18 for detail).

The **table** and **figure** environments (details are in Hours 7 and 9) may not be supported properly in the **multicols** environment. In that case, their starred forms, i.e., **table*** and **figure*** environments, may be used for drawing tables or figures spanning all the columns.

4.4 Mini Pages

Mini pages mean dividing a portion of a page into a number of width-wise parts, usually for presenting related materials side-by-side, e.g., two tables for comparison purpose, a picture and its description, or LaTeX input and its output. Mini pages are

generated through the **minipage** environment with a pair of optional and mandatory arguments, i.e., **\begin{minipage}[**avert**]{**ahorz**}**, where avert is the vertical alignment of the mini page and ahorz is its horizontal width[4]. The allowed vertical alignment options are center (default), top, and bottom, which are denoted by **c**, **t**, and **b**, respectively. In the case of the horizontal width, the sum of widths of all the side-by-side mini pages should not exceed the line width of the main page, otherwise the excess mini pages will be placed in the following lines. Hence, instead of specifying any fixed numeric value (say, 5cm), the width of a mini page may be specified as a fraction of the **\linewidth** command, say '0.4**\linewidth**' to create a mini page of width equal to 40 % of the line width of the main page.

Similar to the **minipage** environment, there exits **boxedminipage** environment also, which is defined in the **boxedminipage** package. The basic difference between the environments is that each mini page created by the **boxedminipage** environment is placed in a box. Applications of the environments are shown in Table 4.4, where

Table 4.4 Dividing a page width-wise using the **minipage** and **boxedminipage** environments

LATEX input	Output	
\documentclass[11pt,a4paper]{article} **\usepackage{boxedminipage}** **%** **\begin{document}** **%** **\begin{minipage}[t]{**5.0**cm}** This minipage is … width is 5.0**\,**cm. **\end{minipage}** **%** **\begin{boxedminipage}[t]{**0.4**\linewidth}** This boxed-minipage is also … **\end{boxedminipage}** **%** **\end{document}**	This minipage is top-aligned and its horizontal width is 5.0cm.	This boxed-minipage is also top-aligned, but its horizontal width is equal to 40% of the page line-width.

both the environments are top-aligned with **minipage** of 5.0 cm width and that of **boxedminipage** is equal to 40 % of the line width of the main page.

4.5 Foot Notes

LATEX provides the **\footnote{}** command for printing its argument as a foot note. The command is to be inserted just after the word or phrase (usually without any gap) against which a foot note is to be generated. In the output, such words or phrases are superscribed in Arabic numerals with the counter of the **\footnote{}** command. The corresponding foot notes are printed serially at the bottom of the pages and

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[4]The **minipage** environment can be used for dividing a portion of a page into a number of width-wise parts, usually for presenting related materials side-by-side, e.g., two tables for comparison purpose, or a picture and its description.

they are marked by superscribing the respective serial numbers on the left side. As shown in Table 4.5, the foot notes on a page are separated from its main materials

Table 4.5 Foot notes generated through the **\footnote{}** command

LATEX input	Output
`Both Rubi and Lila`**\footnote{**`They are sisters.`**}** `study in class I, while Ravi and Joy`**\footnote{**`They are friends.`**\label{**`fn:friends`**}}** `study in class II.`	Both Rubi and Lila[1] study in class I, while Ravi and Joy[2] study in class II. _____ [1]They are sisters. [2]They are friends.

by a small horizontal line. A foot note may contain anything, such as paragraphs, lists, mathematical expressions, tabular materials, etc. Generally a word/phrase and the foot note generated against it appear on the same page. However, a foot note may be continued on the following pages also if it is long enough. On the other hand, the foot notes of a multi-column document are printed in full width at the bottom of a page, irrespective of the columns where from they are generated.

A foot note can be labeled and referred like other numbered items. As shown in Table 4.5, a foot note is to be labeled using **\label{}** inside **{}** of the **\footnote{}** command, and it can be referred as usual by the **\ref{}** command[5].

*4.5.1 Foot Notes in Mini Pages**

The markings and positions of foot notes inside a **minipage** environment are quite different. The foot notes of each mini page are marked by lowercase alphabets (a, b, c, etc.) and placed them at the bottom of the mini page. An example of foot notes in mini pages, along with a foot note in the main page also, is shown in Table 4.6 on the following page. The line break command **\\[2mm]** is used before the first and after the last **minipage** environments for producing the mini pages in a separate paragraph with a gap of 2 mm before and after the paragraph. Moreover, the **\hfill** command is used after the first **minipage** environment for placing the mini pages left and right aligned with the remaining space of the line width of the main page in between the mini pages. As seen in Table 4.6, the foot note in the main page and those inside the mini pages are counted separately (by Arabic numerals in the main page, while by lowercase alphabets in the mini pages).

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[5]Like other numbered items, a foot note generated through **\footnote{}** can also be labeled and referred using **\label{}** and **\ref{}**, respectively.

Table 4.6 Foot notes in mini pages

LaTeX input	Output

`The following is an example of ... mini page`**`\footnote{`**`Foot note style in mini pages is different.`**`}.\\[2mm]`**
`%`
`\begin{minipage}[t]{0.45\linewidth}`
`Both Rubi and Lila`**`\footnote{`**`They are sisters.`**`}`** `study ... Joy`**`\footnote{`**`They are friends.`**`}`** `study in class II.`
`\end{minipage}\hfill`
`%`
`\begin{minipage}[t]{0.45\linewidth}`
`Though the milk of a cow`**`\footnote{`**`Domestic animal.`**`}`** `is ... milk of a tiger`**`\footnote{`**`Wild animal.`**`}.`**
`\end{minipage}\\[2mm]`
`%`
`Foot notes in a mini page are marked by lowercase alphabets and placed ...`
	The following is an example of foot notes inside a mini page[1].
	
	Both Rubi and Lila[a] study in class I, while Ravi and Joy[b] study in class II. Though the milk of a cow[a] is used in various food products, nobody bothers about the milk of a tiger[b].
	
	———————
	  [a] They are sisters. ———————
	  [b] They are friends. [a] Domestic animal.
	                           [b] Wild animal.
	
	Foot notes in a mini page are marked by lowercase alphabets and placed at the bottom of the mini page.
	
	———————
	[1] Foot note style in mini pages is different.

4.5.2 *Altering the Pattern of Foot Notes**

By default, foot notes are numbered in Arabic numerals. Other markings can be obtained by redefining the **\thefootnote** command in the preamble. For example, the **\renewcommand{\thefootnote}{\fnsymbol{footnote}}** command may be used for marking the foot notes by symbols like ∗, †, ‡, §, etc.

Although the markings of foot notes inside mini pages can also be altered by changing their counter **mpfootnote** by redefining the **\thempfootnote** command, still the markings are started afresh in each mini page. Such markings may be confusing in many cases, particularly if a foot note is to be referred. LaTeX provides the **\footnotemark** and **\footnotetext{}** commands through which the foot note of a mini page can also be made to work like foot notes in main pages[6]. That is, the commands alter the counter of the foot notes of a mini page from **mpfootnote** to **footnote**, which is the counter of foot notes of main pages. The application of the **\footnotemark** and **\footnotetext{}** commands is shown in Table 4.7 on the next page. Like the **\footnote{}** command in main pages, the **\footnotemark** command in a **minipage** environment is used just after the word or phrase against which a foot note is to be generated. Then the contents of the foot note are written as the argument of the **\footnotetext{}** command immediate after the **minipage** environment. A foot note of a mini page, generated through the **\footnotemark** and **\footnotetext{}** commands, can be labeled and referred as an ordinary foot note. In that case, as shown in the second **minipage** environment in Table 4.7, the foot note is to be labeled inside **{}** of the **\footnotetext{}** command. However, this process for generating foot notes in mini pages has the drawback that only one foot note can be generated against a **minipage** environment.

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[6] LaTeX provides **\footnotemark** and **\footnotetext{}** for generating foot notes in mini pages, similar to those in main pages generated through **\footnote{}**.

Table 4.7 Foot notes of a mini page to work like those in main pages

LaTeX input	Output
The following is an example of ... mini page**\footnote{**Foot note style in mini pages is different.**}.\\[**2**mm]** **%** **\begin{minipage}[t]{**0.45**\linewidth}** Both Rubi and Lila**\footnotemark**␣study in class I. **\end{minipage}** **\footnotetext{**They are sisters.**}\hfill** **%** **\begin{minipage}[t]{**0.45**\linewidth}** The milk of a cow**\footnotemark**␣is ... **\end{minipage}** **\footnotetext{**Domestic animal.**\label{**fn:cow**}}\\{**2**mm]** **%** Foot notes in a mini page are marked ...	The following is an example of foot notes inside a mini page[1]. Both Rubi and Lila[2] The milk of a cow[3] is study in class I. used in various food products. Foot notes in a mini page are marked by lowercase alphabets and placed at the bottom of the mini page. ——————— [1]Foot note style in mini pages is different. [2]They are sisters. [3]Domestic animal.

The inclusion of the **fnpara** package prints all the foot notes of a page in a single paragraph, instead of stacking them one below another. To put all the foot notes in the right column in a two-column document, the **ftnright** package may be loaded.

Similar to the **\footnote{}** command, the **\endnote{}** command under the **endnotes** package may be used for printing notes at the end of a chapter or document under the heading 'Notes'. Foot notes can also be printed as end notes by redefining the **\footnote** command as **\renewcommand{\footnote}{\endnote}**.

4.6   Marginal Notes*

LaTeX provides the **\marginpar{}** command for printing an important note in the margin of a document. An application of the command can be seen just outside of this line, which is produced by inserting '**\marginpar{\em** Marginal note.**}**' after the word line in the current sentence of this book. A marginal note is started against the line of a page in which the **\marginpar{}** command appears.

Marginal note.

The **\marginpar{}** command usually prints its argument as a marginal note in the right margin of a page. In the case of a **twoside** document, such as **book**, a marginal note is printed in the right margin of an odd numbered page and in the left margin of an even numbered page. In a **twocolumn** document, a marginal note is printed in the nearest margin. Although LaTeX decides the correct margin on its own without bothering a user, a problem may arise if an arrow is to be used in the margin to point some texts. This is because, as shown in the margin of this line, a left-pointing arrow is required in the right margin and a right-pointing one is required in the left margin. However, it is not known beforehand in which margin the arrow will appear, for which it would be confusing whether a right-pointing or a left-pointing arrow is

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to be used. LATEX avoids this confusion also by allowing the **\marginpar{}** command
to take an optional argument, which is processed if the marginal note is to appear in
the left margin, otherwise the mandatory argument is processed to print the marginal
$\Longrightarrow$ note in the right margin. For example, the arrow in the margin of this line is obtained
through the **\marginpar[$\Longrightarrow$\Longrightarrow$]{$\Longleftarrow$\Longleftarrow$}** command.

When the **\marginpar{}** command is used for printing a marginal note, the page size
of a document is to be adjusted to accommodate the marginal notes. The commands
required in this regard include **\marginparwidth**, **\marginparsep**, and **\marginparpush**.
These commands signify, respectively, the width of a marginal note, the horizontal gap
between the main texts of a page and a marginal note, and the vertical gap between
two successive marginal notes. As addressed in §5.1.2 and shown in Table 5.3 on
page 40, all of these three commands are to be put in the preamble, with appropri-
ate values, along with other page setting commands. As an example, in this book,
the **\marginparwidth**, **\marginparsep**, and **\marginparpush** commands are assigned the
values of 12 mm, 3 mm, and 15 mm, respectively.