\LaTeX{} 2\varepsilon

The macro package for \TeX

by
Leslie Lamport et al.

Edition 1.6

December 1994
This is edition 1.6 of the LaTeX2e documentation, and is for the Texinfo that is distributed as part of Version 19 of GNU Emacs. It uses version 2.134 or later of the `texinfo.tex’ input file.

This is translated from LATEX.HLP v1.0a in the VMS Help Library. This pre-translation version was written by George D. Greenwade of Sam Houston State University. It has been edited to this form by Paul Nothard of Edinburgh University.

The original (latex.texi and latex2.texi) was distributed by Stephen Gilmore <stg@dcs.ed.ac.uk>, August 26th 1993.

Version 1.1 was made by Piet van Oostrum <piet@cs.run.nl> on Dec 14, 1993 by merging and cleaning up latex.texi and latex2.texi.

Versions 1.2 trough 1.6 by Torsten Martinsen <bullestock@dk-online.dk>.

This Texinfo file may be copied and distributed in accordance with the usual copying permissions of the Free Software Foundation. These permissions are given in the General Public License section of the “GNU Emacs Manual”. This software comes with NO WARRANTY.

Permission is granted to make and distribute verbatim copies of this manual provided the copyright notice and this permission notice are preserved on all copies.

Permission is granted to copy and distribute modified versions of this manual under the conditions for verbatim copying, provided that the entire resulting derived work is distributed under the terms of a permission notice identical to this one.
LaTeX2e is a document preparation system implemented as a macro package for Donald E. Knuth’s TeX typesetting program.

LaTeX was originally conceived by Leslie Lamport.

This is edition 1.6 of the LaTeX2e documentation.
1 Overview of \LaTeX{} and Local Guide

The \LaTeX{} command typesets a file of text using the TeX program and the \LaTeX{} Macro package for TeX. To be more specific, it processes an input file containing the text of a document with interspersed commands that describe how the text should be formatted. It produces at least three files as output:

1. A “Device Independent”, or ‘.dvi’ file. This contains commands that can be translated into commands for a variety of output devices. You can view the output of \LaTeX{} by using a program such as xdvi, which actually uses the ‘.dvi’ file.

2. A “transcript” or ‘.log’ file that contains summary information and diagnostic messages for any errors discovered in the input file.

3. An “auxiliary” or ‘.aux’ file. This is used by \LaTeX{} itself, for things such as sectioning.


For a description of \LaTeX{}, you should consult:


The \LaTeX{} Companion, by Michel Goossens, Frank Mittelbach, and Alexander Samarin, Addison-Wesley, 1994.
2 Commands

A LaTeX command begins with the command name, which consists of a \ followed by either (a) a string of letters or (b) a single non-letter. Arguments contained in square brackets, [], are optional while arguments contained in braces, {}, are required.

NOTE: LaTeX is case sensitive. Enter all commands in lower case unless explicitly directed to do otherwise.

2.1 Counters

Everything LaTeX numbers for you has a counter associated with it. The name of the counter is the same as the name of the environment or command that produces the number, except with no \. (enumi - enumiv are used for the nested enumerate environment.) Below is a list of the counters used in LaTeX's standard document classes to control numbering.

<table>
<thead>
<tr>
<th>part</th>
<th>paragraph</th>
<th>figure</th>
<th>enumi</th>
</tr>
</thead>
<tbody>
<tr>
<td>chapter</td>
<td>subparagraph</td>
<td>table</td>
<td>enumii</td>
</tr>
<tr>
<td>section</td>
<td>page</td>
<td>footnote</td>
<td>enumiii</td>
</tr>
<tr>
<td>subsection</td>
<td>equation</td>
<td>mpfootnote</td>
<td>enumiv</td>
</tr>
<tr>
<td>subsubsection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.1.1 \addtocounter

\addtocounter{counter}{value}

The \addtocounter command increments the counter by the amount specified by the value argument. The value argument can be negative.

2.1.2 \alph

\alph{counter}

This command causes the value of the counter to be printed in alphabetic characters. The \alph command uses lower case alphabetic alphabetic characters, i.e., a, b, c... while the \Alph command uses upper case alphabetic characters, i.e., A, B, C....

2.1.3 \arabic

\arabic{counter}

The \arabic command causes the value of the counter to be printed in Arabic numbers, i.e., 3.

2.1.4 \fnsymbol

\fnsymbol{counter}

The \fnsymbol command causes the value of the counter to be printed in a specific sequence of nine symbols that can be used for numbering footnotes.

eg. From 1-9: * † ‡ § ¶ ** *** ****

NB. counter must have a value between 1 and 9 inclusive.
2.1.5 \newcounter

\newcounter{foo}[counter]

The \newcounter command defines a new counter named foo. The counter is initialized to zero.

The optional argument [counter] causes the counter foo to be reset whenever the counter named in the optional argument is incremented.

2.1.6 \refstepcounter

\refstepcounter{counter}

The \refstepcounter command works like \stepcounter See Section 2.1.8 \stepcounter, page 6, except it also defines the current \ref value to be the result of \thecounter.

2.1.7 \roman

\roman{counter}

This command causes the value of the counter to be printed in Roman numerals. The \roman command uses lower case Roman numerals, i.e., i, ii, iii..., while the \Roman command uses upper case Roman numerals, i.e., I, II, III....

2.1.8 \stepcounter

\stepcounter{counter}

The \stepcounter command adds one to the counter and resets all subsidiary counters.

2.1.9 \setcounter

\setcounter{counter}{value}

The \setcounter command sets the value of the counter to that specified by the value argument.

2.1.10 \usecounter

\usecounter{counter}

The \usecounter command is used in the second argument of the list environment to allow the counter specified to be used to number the list items.

2.1.11 \value

\value{counter}

The \value command produces the value of the counter named in the mandatory argument. It can be used where LaTeX expects an integer or number, such as the second argument of a \setcounter or \addtocounter command, or in:
\hspace{\value{foo}\parindent}

It is useful for doing arithmetic with counters.
2.2 Cross References

One reason for numbering things like figures and equations is to refer the reader to them, as in “See Figure 3 for more details.”

2.2.1 \label

\label{key}

A \label command appearing in ordinary text assigns to the key the number of the current sectional unit; one appearing inside a numbered environment assigns that number to the key.

A key can consist of any sequence of letters, digits, or punctuation characters. Upper and lowercase letters are different.

To avoid accidentally creating two labels with the same name, it is common to use labels consisting of a prefix and a suffix separated by a colon. The prefixes conventionally used are

- cha for chapters
- sec for lower-level sectioning commands
- fig for figures
- tab for tables
- eq for equations

Thus, a label for a figure would look like \texttt{fig:bandersnatch}.

2.2.2 \pageref

\pageref{key}

The \texttt{pageref} command produces the page number of the place in the text where the corresponding \texttt{label} command appears, i.e. where \texttt{\label{key}} appears.

2.2.3 \ref

\ref{key}

The \texttt{ref} command produces the number of the sectional unit, equation number, ... of the corresponding \texttt{label} command.
2.3 Definitions

2.3.1 \newcommand

\newcommand{cmd}[args]{definition}
\newcommand{cmd}[args][default]{definition}
\renewcommand{cmd}[args]{definition}
\renewcommand{cmd}[args][default]{definition}

These commands define (or redefine) a command.

\texttt{cmd} \hspace{1em} A command name beginning with a \texttt{\}. For \texttt{\newcommand} it must not be already defined and must not begin with \texttt{\end}; for \texttt{\renewcommand} it must already be defined.

\texttt{args} \hspace{1em} An integer from 1 to 9 denoting the number of arguments of the command being defined. The default is for the command to have no arguments.

\texttt{def} \hspace{1em} If this optional parameter is present, it means that the command's first argument is optional. The default value of the optional argument is \texttt{def}.

\texttt{definition} \hspace{1em} The text to be substituted for every occurrence of \texttt{cmd}; a parameter of the form \texttt{#n} in \texttt{cmd} is replaced by the text of the $n$th argument when this substitution takes place.

2.3.2 \newenvironment

\newenvironment{nam}[args]{begdef}{enddef}
\newenvironment{nam}[args][default]{begdef}{enddef}
\renewenvironment{nam}[args]{begdef}{enddef}
\renewenvironment{nam}[args][default]{begdef}{enddef}

These commands define or redefine an environment.

\texttt{nam} \hspace{1em} The name of the environment. For \texttt{\newenvironment} there must be no currently defined environment by that name, and the command \texttt{\nam} must be undefined. For \texttt{\renewenvironment} the environment must already be defined.

\texttt{args} \hspace{1em} An integer from 1 to 9 denoting the number of arguments of the newly-defined environment. The default is no arguments.

\texttt{default} \hspace{1em} If this is specified, the first argument is optional, and \texttt{default} gives the default value for that argument.

\texttt{begdef} \hspace{1em} The text substituted for every occurrence of \texttt{\begin{nam}}; a parameter of the form \texttt{#n} in \texttt{cmd} is replaced by the text of the $n$th argument when this substitution takes place.

\texttt{enddef} \hspace{1em} The text substituted for every occurrence of \texttt{\end{nam}}. It may not contain any argument parameters.
2.3.3 \newtheorem

\newtheorem{env_name}[caption]{caption}[within]
\newtheorem{env_name}[numbered_like]{caption}

This command defines a theorem-like environment.

env_name  The name of the environment to be defined. A string of letters. It must not be
          the name of an existing environment or counter.

caption  The text printed at the beginning of the environment, right before the number.
         This may simply say “Theorem”, for example.

within  The name of an already defined counter, usually of a sectional unit. Provides
        a means of resetting the new theorem counter within the sectional unit.

numbered_like
        The name of an already defined theorem-like environment.

The \newtheorem command may have at most one optional argument.

2.3.4 \newfont

\newfont{cmd}{font_name}

Defines the command name cmd, which must not be currently defined, to be a declaration
that selects the font named font_name to be the current font.
2.4 Document Classes

Valid LaTeX document classes include:

- article
- report
- letter
- book
- slides

Other document classes are often available. See Chapter 1 [Overview], page 3, for details. They are selected with the following command:

\documentclass [options] {class}

All the standard classes (except slides) accept the following options for selecting the typeface size (10 pt is default):

- 10pt, 11pt, 12pt
- All classes accept these options for selecting the paper size (default is letter):
  - a4paper, a5paper, b5paper, letterpaper, legalpaper, executivepaper
- Miscellaneous options:
  - landscape — selects landscape format. Default is portrait.
  - titlepage, notitlepage — selects if there should be a separate title page.
  - leqno — equation number on left side of equations. Default is right side.
  - fleqn — displayed formulas flush left. Default is centred.
  - openbib — use “open” bibliography format.
  - draft, final — mark/do not mark overfull boxes with a rule. Default is final.

These options are not available with the slides class:

- twoside, oneside — selects one- or twosided layout. Default is oneside, except for the book class.
- openright, openany — determines if a chapter should start on a right-hand page. Default is openright for book.
- twocolumn, onecolumn — one or two columns. Defaults to one column.

The slides class offers the option clock for printing the time at the bottom of each note.

If you specify more than one option, they must be separated by a comma.

Additional packages are loaded by a

\usepackage [options] {pkg}

command. If you specify more than one package, they must be separated by a comma.

Any options given in the \documentclass command that are unknown by the selected document class are passed on to the packages loaded with \usepackage.
2.5 Layout

Miscellaneous commands for controlling the general layout of the page.

2.5.1 \flushbottom

The \flushbottom declaration makes all text pages the same height, adding extra vertical space when necessary to fill out the page.
This is the standard if twocolumn mode is selected.

2.5.2 \onecolumn

The \onecolumn declaration starts a new page and produces single-column output.

2.5.3 \raggedbottom

The \raggedbottom declaration makes all pages the height of the text on that page. No extra vertical space is added.

2.5.4 \twocolumn

\twocolumn[<text>]

The \twocolumn declaration starts a new page and produces two-column output. If the optional text argument is present, it is typeset in one-column mode.
2.6 Environments

LaTeX provides a number of different paragraph-making environments. Each environment begins and ends in the same manner.

\begin{environment-name}
  .
  .
\end{environment-name}

2.6.1 array

\begin{array}{col1col2...coln}
column 1 entry & column 2 entry \ldots & column n entry \\
  .
  .
\end{array}

Math arrays are produced with the array environment. It has a single mandatory argument describing the number of columns and the alignment within them. Each column, \texttt{coln}, is specified by a single letter that tells how items in that row should be formatted.

- \texttt{c} — for centred
- \texttt{l} — for flush left
- \texttt{r} — for flush right

Column entries must be separated by an \&. Column entries may include other LaTeX commands. Each row of the array must be terminated with the string `\\'.

Note that the array environment can only be used in math mode, so normally it is used inside an equation environment.

2.6.2 center

\begin{center}
  Text on line 1 \\
  Text on line 2 \\
  .
  .
\end{center}

The center environment allows you to create a paragraph consisting of lines that are centred within the left and right margins on the current page. Each line must be terminated with the string `\\'.

2.6.2.1 \texttt{centering}

This declaration corresponds to the center environment. This declaration can be used inside an environment such as \texttt{quote} or in a \texttt{parbox}. The text of a figure or table can be
centred on the page by putting a \centering command at the beginning of the figure or

table environment.

Unlike the center environment, the \centering command does not start a new para-
graph; it simply changes how LaTeX formats paragraph units. To affect a paragraph unit’s
format, the scope of the declaration must contain the blank line or \end command (of an
environment like quote) that ends the paragraph unit.

2.6.3 description

\begin{description}
\item [label] First item
\item [label] Second item
\end{description}

The description environment is used to make labelled lists. The label is bold face
and flushed right.

2.6.4 enumerate

\begin{enumerate}
\item First item
\item Second item
\end{enumerate}

The enumerate environment produces a numbered list. Enumerations can be nested
within one another, up to four levels deep. They can also be nested within other paragraph-
making environments.

Each item of an enumerated list begins with an \item command. There must be at least
one \item command within the environment.

The enumerate environment uses the enumi through enumiv counters (see Section 2.1
[Counters], page 5). The type of numbering can be changed by redefining \theenumi etc.

2.6.5 eqnarray

\begin{eqnarray}
\text{math formula 1} & & \\
\text{math formula 2} & & \\
\end{eqnarray}
The `equarray` environment is used to display a sequence of equations or inequalities. It is very much like a three-column `array` environment, with consecutive rows separated by `\` and consecutive items within a row separated by an `&`.

An equation number is placed on every line unless that line has a `\nonumber` command. The command `\lefteqn` is used for splitting long formulas across lines. It typesets its argument in display style flush left in a box of zero width.

### 2.6.6 equation

```latex
\begin{equation}
  \text{math formula}
\end{equation}
```

The `equation` environment centres your equation on the page and places the equation number in the right margin.

### 2.6.7 figure

```latex
\begin{figure}[placement]

  \text{body of the figure}

\caption{figure title}
\end{figure}
```

Figures are objects that are not part of the normal text, and are usually “floated” to a convenient place, like the top of a page. Figures will not be split between two pages.

The optional argument `[placement]` determines where LaTeX will try to place your figure. There are four places where LaTeX can possibly put a float:

1. h (Here) - at the position in the text where the figure environment appears.
2. t (Top) - at the top of a text page.
3. b (Bottom) - at the bottom of a text page.
4. p (Page of floats) - on a separate float page, which is a page containing no text, only floats.

The standard report and article classes use the default placement `tbp`.

The body of the figure is made up of whatever text, LaTeX commands, etc. you wish. The `\caption` command allows you to title your figure.

### 2.6.8 flushleft

```latex
\begin{flushleft}
  \text{Text on line 1} \\
  \text{Text on line 2} \\
  \text{.}
  \text{.}
  \text{.}
\end{flushleft}
```
The \texttt{flushleft} environment allows you to create a paragraph consisting of lines that are flushed left, to the left-hand margin. Each line must be terminated with the string `\\`.

\subsection{\texttt{raggedright}}

This declaration corresponds to the \texttt{flushleft} environment. This declaration can be used inside an environment such as \texttt{quote} or in a \texttt{parbox}.

Unlike the \texttt{flushleft} environment, the \texttt{\raggedright} command does not start a new paragraph; it simply changes how \LaTeX{} formats paragraph units. To affect a paragraph unit's format, the scope of the declaration must contain the blank line or \texttt{\end} command (of an environment like \texttt{quote}) that ends the paragraph unit.

\subsection{\texttt{flushright}}

\begin{verbatim}
\begin{flushright}
Text on line 1 \\
Text on line 2 \\
. \\
. \\
\end{flushright}
\end{verbatim}

The \texttt{flushright} environment allows you to create a paragraph consisting of lines that are flushed right, to the right-hand margin. Each line must be terminated with the string `\\`.

\subsection{\texttt{raggedleft}}

This declaration corresponds to the \texttt{flushright} environment. This declaration can be used inside an environment such as \texttt{quote} or in a \texttt{parbox}.

Unlike the \texttt{flushright} environment, the \texttt{\raggedleft} command does not start a new paragraph; it simply changes how \LaTeX{} formats paragraph units. To affect a paragraph unit's format, the scope of the declaration must contain the blank line or \texttt{\end} command (of an environment like \texttt{quote}) that ends the paragraph unit.

\subsection{\texttt{itemize}}

\begin{verbatim}
\begin{itemize}
\item First item
\item Second item
. \\
. \\
\end{itemize}
\end{verbatim}

The \texttt{itemize} environment produces a "bulleted" list. Itemizations can be nested within one another, up to four levels deep. They can also be nested within other paragraph-making environments.
Each item of an itemized list begins with an \item command. There must be at least one \item command within the environment.

The itemize environment uses the itemi through itemiv counters (see Section 2.1 [Counters], page 5). The type of numbering can be changed by redefining \theitemi etc.

2.6.11 letter

This environment is used for creating letters. See Section 2.9 [Letters], page 29.

2.6.12 list

The list environment is a generic environment which is used for defining many of the more specific environments. It is seldom used in documents, but often in macros.

\begin{list}{\labelitemi}{\labelitemii}{\labelitemiii}{\labelitemiv}
\item First item
\item Second item
\item ...
\item ...
\end{list}

The \{label\} argument specifies how items should be labelled. This argument is a piece of text that is inserted in a box to form the label. This argument can and usually does contain other \LaTeX\ commands.

The \{spacing\} argument contains commands to change the spacing parameters for the list. This argument will most often be null, i.e., \{\}. This will select all default spacing which should suffice for most cases.

2.6.13 minipage

\begin{minipage}{position}{width}
\begin{center}
text
\end{center}
\end{minipage}

The minipage environment is similar to a \parbox command. It takes the same optional position argument and mandatory width argument. You may use other paragraph-making environments inside a minipage.

Footnotes in a minipage environment are handled in a way that is particularly useful for putting footnotes in figures or tables. A \footnote or \footnotetext command puts the footnote at the bottom of the minipage instead of at the bottom of the page, and it uses the mpfootnote counter instead of the ordinary footnote counter. See Section 2.1 [Counters], page 5.

NOTE: Don't put one minipage inside another if you are using footnotes; they may wind up at the bottom of the wrong minipage.
2.6.14 picture

\begin{picture}(width, height)(x offset, y offset)

\begin{picture}(100, 200)(10, 20)

\end{picture}

The picture environment allows you to create just about any kind of picture you want containing text, lines, arrows and circles. You tell \LaTeX{} where to put things in the picture by specifying their coordinates. A coordinate is a number that may have a decimal point and a minus sign — a number like 5, 2.3 or –3.1416. A coordinate specifies a length in multiples of the unit length \texttt{unitlength}, so if \texttt{unitlength} has been set to 1\,cm, then the coordinate 2.54 specifies a length of 2.54 centimetres. You can change the value of \texttt{unitlength} anywhere you want, using the \texttt{setlength} command, but strange things will happen if you try changing it inside the picture environment.

A position is a pair of coordinates, such as (2.4, –5), specifying the point with x-coordinate 2.4 and y-coordinate –5. Coordinates are specified in the usual way with respect to an origin, which is normally at the lower-left corner of the picture. Note that when a position appears as an argument, it is not enclosed in braces; the parentheses serve to delimit the argument.

The picture environment has one mandatory argument, which is a position. It specifies the size of the picture. The environment produces a rectangular box with width and height determined by this argument's x- and y-coordinates.

The picture environment also has an optional position argument, following the size argument, that can change the origin. (Unlike ordinary optional arguments, this argument is not contained in square brackets.) The optional argument gives the coordinates of the point at the lower-left corner of the picture (thereby determining the origin). For example, if \texttt{unitlength} has been set to 1\,mm, the command

\begin{picture}(100, 200)(10, 20)

produces a picture of width 100 millimetres and height 200 millimetres, whose lower-left corner is the point (10,20) and whose upper-right corner is therefore the point (110,220). When you first draw a picture, you will omit the optional argument, leaving the origin at the lower-left corner. If you then want to modify your picture by shifting everything, you just add the appropriate optional argument.

The environment's mandatory argument determines the nominal size of the picture. This need bear no relation to how large the picture really is; \LaTeX{} will happily allow you to put things outside the picture, or even off the page. The picture's nominal size is used by \LaTeX{} in determining how much room to leave for it.

Everything that appears in a picture is drawn by the \texttt{put} command. The command

\begin{picture}(100, 200)(10, 20)

\texttt{put (11.3, –3)\ldots}

puts the object specified by \ldots{} in the picture, with its reference point at coordinates (11.3, –3). The reference points for various objects will be described below.
The \put command creates an LR box. You can put anything in the text argument of the \put command that you'd put into the argument of an \mbox and related commands. When you do this, the reference point will be the lower left corner of the box.

Picture commands:

2.6.14.1 \circle

\circle[*]{diameter}

The \circle command produces a circle with a diameter as close to the specified one as possible. If the *-form of the command is used, LaTeX draws a solid circle.

Note that only circles up to 40 pt can be drawn.

2.6.14.2 \dashbox

Draws a box with a dashed line.

\dashbox{dash_length}{width,height}{...}

The \dashbox has an extra argument which specifies the width of each dash. A dashed box looks best when the width and height are multiples of the dash_length.

2.6.14.3 \frame

\frame{...}

The \frame command puts a rectangular frame around the object specified in the argument. The reference point is the bottom left corner of the frame. No extra space is put between the frame and the object.

2.6.14.4 \framebox

\framebox{width,height}[position]{...}

The \framebox command is exactly the same as the \makebox command, except that it puts a frame around the outside of the box that it creates.

The \framebox command produces a rule of thickness \fboxrule, and leaves a space \fboxsep between the rule and the contents of the box.

2.6.14.5 \line

\line{x\ slope,y\ slope}{length}

The \line command draws a line of the specified length and slope.

Note that LaTeX can only draw lines with slope = \( x/y \), where \( x \) and \( y \) have integer values from -6 through 6.

2.6.14.6 \linethickness

\linethickness{dimension}

Declares the thickness of horizontal and vertical lines in a picture environment to be \( \text{dimension} \), which must be a positive length. It does not affect the thickness of slanted lines and circles, or the quarter circles drawn by \oval to form the corners of an oval.
2.6.14.7 \makebox

\makebox[width, height][position]{...}

The \makebox command for the picture environment is similar to the normal \makebox command except that you must specify a width and height in multiples of \unitlength.

The optional argument, [position], specifies the quadrant that your text appears in. You may select up to two of the following:

- t - Moves the item to the top of the rectangle
- b - Moves the item to the bottom
- l - Moves the item to the left
- r - Moves the item to the right

See Section 2.17.14 [\makebox], page 44.

2.6.14.8 \multiput

\multiput(x coord, y coord)(delta x, delta y){number of copies}{object}

The \multiput command can be used when you are putting the same object in a regular pattern across a picture.

2.6.14.9 \oval

\oval[width, height][portion]

The \oval command produces a rectangle with rounded corners. The optional argument, [portion], allows you to select part of the oval.

- t - Selects the top portion
- b - Selects the bottom portion
- r - Selects the right portion
- l - Selects the left portion

Note that the “corners” of the oval are made with quarter circles with a maximum radius of 20 pt, so large “ovals” will look more like boxes with rounded corners.

2.6.14.10 \put

\put(x coord, y coord){... }

The \put command places the item specified by the mandatory argument at the given coordinates.

2.6.14.11 \shortstack

\shortstack[position]{... \ \ ... \ \ ...}

The \shortstack command produces a stack of objects. The valid positions are:

- r - Moves the objects to the right of the stack
- l - Moves the objects to the left of the stack
- c - Moves the objects to the centre of the stack (default)
2.6.14.12 \texttt{vector}

\texttt{vector(x slope,y slope){length}}

The \texttt{vector} command draws a line with an arrow of the specified length and slope. The x and y values must lie between -4 and +4, inclusive.

2.6.15 \texttt{quotation}

\begin{verbatim}
\begin{quotation}
text
\end{quotation}
\end{verbatim}

The margins of the \texttt{quotation} environment are indented on the left and the right. The text is justified at both margins and there is paragraph indentation. Leaving a blank line between text produces a new paragraph.

2.6.16 \texttt{quote}

\begin{verbatim}
\begin{quote}
text
\end{quote}
\end{verbatim}

The margins of the \texttt{quote} environment are indented on the left and the right. The text is justified at both margins. Leaving a blank line between text produces a new paragraph.

2.6.17 \texttt{tabbing}

\begin{verbatim}
\begin{tabbing}
text \= more text \= still more text \= last text \=
second row \>
\> more \>
. 
. 
\end{tabbing}
\end{verbatim}

The \texttt{tabbing} environment provides a way to align text in columns. It works by setting tab stops and tabbing to them much the way you do with an ordinary typewriter.

It is best suited for cases where the width of each column is constant and known in advance.

This environment can be broken across pages, unlike the \texttt{tabular} environment.

The following commands can be used inside a \texttt{tabbing} environment:

\begin{verbatim}
\=
\>
\<
\end{verbatim}

- \texttt{\=} Sets a tab stop at the current position.
- \texttt{\>} Advances to the next tab stop.
- \texttt{\<} This command allows you to put something to the left of the local margin without changing the margin. Can only be used at the start of the line.
\+  
Moves the left margin of the next and all the following commands one tab stop to the right.

\-  
Moves the left margin of the next and all the following commands one tab stop to the left.

\  
Moves everything that you have typed so far in the current column, i.e. everything from the most recent \>, \<, \', \, or \kill command, to the right of the previous column, flush against the current column's tab stop.

\  
Allows you to put text flush right against any tab stop, including tab stop 0. However, it can't move text to the right of the last column because there's no tab stop there. The \' command moves all the text that follows it, up to the \ or \end{tabbing} command that ends the line, to the right margin of the tabbing environment. There must be no \> or \' command between the \' and the command that ends the line.

\kill  
Sets tab stops without producing text. Works just like \ except that it throws away the current line instead of producing output for it. The effect of any \#, \+ or \- commands in that line remain in effect.

\pushtabs  
Saves all current tab stop positions. Useful for temporarily changing tab stop positions in the middle of a tabbing environment.

\pushtabs  
Restores the tab stop positions saved by the last \pushtabs.

\a  
In a tabbing environment, the commands \#, \' and \' do not produce accents as normal. Instead, the commands \#a, \a and \a are used.

This example typesets a Pascal function in a traditional format:

\begin{tabbing}
\begin{verbatim}
\begin{tabbing}
function \= fact(n : integer) : integer;\$
  \> begin \= \+ \$
  \> if \= n \>$1 then \+ \$
     fact := n * fact(n-1) \- \$
  else \+$\$
     fact := 1; \-$\$
  end;\$
\end{tabbing}
\end{verbatim}
\end{tabbing}
2.6.18 table

\begin{table}[placement]
body of the table
\caption{table title}
\end{table}

Tables are objects that are not part of the normal text, and are usually “floated” to a convenient place, like the top of a page. Tables will not be split between two pages.

The optional argument \texttt{placement} determines where \LaTeX{} will try to place your table. There are four places where \LaTeX{} can possibly put a float:

- \texttt{h} : Here - at the position in the text where the table environment appears.
- \texttt{t} : Top - at the top of a text page.
- \texttt{b} : Bottom - at the bottom of a text page.
- \texttt{p} : Page of floats - on a separate float page, which is a page containing no text, only floats.

The standard \texttt{report} and \texttt{article} classes use the default placement \texttt{[tbp]}.

The body of the table is made up of whatever text, \LaTeX{} commands, etc., you wish. The \texttt{\caption} command allows you to title your table.

2.6.19 tabular

\begin{tabular}[pos]{cols}
column 1 entry & column 2 entry ... & column n entry \\
.\
.\
\end{tabular}

or

\begin{tabular*}[width{pos}]{cols}
column 1 entry & column 2 entry ... & column n entry \\
.\
.\
\end{tabular*}

These environments produce a box consisting of a sequence of rows of items, aligned vertically in columns. The mandatory and optional arguments consist of:

- \texttt{width} : Specifies the width of the \texttt{tabular*} environment. There must be rubber space between columns that can stretch to fill out the specified width.
- \texttt{pos} : Specifies the vertical position; default is alignment on the centre of the environment.
  - \texttt{t} - align on top row
  - \texttt{b} - align on bottom row
\texttt{cols} \hspace{1cm} Specifies the column formatting. It consists of a sequence of the following specifiers, corresponding to the sequence of columns and intercolumn material.

- \texttt{1} - A column of left-aligned items.
- \texttt{r} - A column of right-aligned items.
- \texttt{c} - A column of centred items.
- \texttt{l} - A vertical line the full height and depth of the environment.

- \texttt{@\{text\}} - This inserts \texttt{text} in every row. An \texttt{@}-expression suppresses the intercolumn space normally inserted between columns; any desired space between the inserted text and the adjacent items must be included in text. An \texttt{\extracolsep{wd}} command in an \texttt{@}-expression causes an extra space of width \texttt{wd} to appear to the left of all subsequent columns, until countermanded by another \texttt{\extracolsep} command. Unlike ordinary intercolumn space, this extra space is not suppressed by an \texttt{@}-expression. An \texttt{\extracolsep} command can be used only in an \texttt{@}-expression in the \texttt{cols} argument.

- \texttt{p\{wd\}} - Produces a column with each item typeset in a parbox of width \texttt{wd}, as if it were the argument of a \texttt{\parbox[t]{wd}} command. However, a \texttt{\}} may not appear in the item, except in the following situations:
  1. inside an environment like \texttt{minipage}, \texttt{array}, or \texttt{tabular}.
  2. inside an explicit \texttt{\parbox}.
  3. in the scope of a \texttt{\centering}, \texttt{\raggedright}, or \texttt{\raggedleft} declaration. The latter declarations must appear inside braces or an environment when used in a \texttt{p}-column element.

- \texttt{*\{num\}-\{cols\}} - Equivalent to \texttt{num} copies of \texttt{cols}, where \texttt{num} is any positive integer and \texttt{cols} is any list of column-specifiers, which may contain another \texttt{*}-expression.

These commands can be used inside a \texttt{tabular} environment:

\subsection*{2.6.19.1 \texttt{\cline}}

\texttt{\cline\{i-j\}}

The \texttt{\cline} command draws horizontal lines across the columns specified, beginning in column \texttt{i} and ending in column \texttt{j}, which are identified in the mandatory argument.

\subsection*{2.6.19.2 \texttt{\hline}}

The \texttt{\hline} command will draw a horizontal line the width of the table. It's most commonly used to draw a line at the top, bottom, and between the rows of the table.

\subsection*{2.6.19.3 \texttt{\multicolumn}}

\texttt{\multicolumn\{cols\}\{pos\}\{text\}}

The \texttt{\multicolumn} is used to make an entry that spans several columns. The first mandatory argument, \texttt{cols}, specifies the number of columns to span. The second mandatory
argument, \texttt{pos}, specifies the formatting of the entry; \texttt{c} for centred, \texttt{l} for flushleft, \texttt{r} for flushright. The third mandatory argument, \texttt{text}, specifies what text is to make up the entry.

\subsection*{2.6.19.4 \texttt{\textbackslash vline}}

The \texttt{\textbackslash vline} command will draw a vertical line extending the full height and depth of its row. An \texttt{\textbackslash fill} command can be used to move the line to the edge of the column. It can also be used in an \$expression.

\section*{2.6.20 \texttt{thebibliography}}

\begin{verbatim}
\begin{thebibliography}{widest-label}
\bibitem[label]{cite_key}
\ldots
\end{thebibliography}
\end{verbatim}

The \texttt{thebibliography} environment produces a bibliography or reference list. In the \texttt{article} class, this reference list is labelled “References”; in the \texttt{report} class, it is labelled “Bibliography”.

- \texttt{widest-label}: Text that, when printed, is approximately as wide as the widest item label produces by the \texttt{bibitem} commands.

\subsection*{2.6.20.1 \texttt{\textbackslash bibitem}}

\begin{verbatim}
\bibitem[label]{cite_key}
\end{verbatim}

The \texttt{\textbackslash bibitem} command generates an entry labelled by \texttt{label}. If the \texttt{label} argument is missing, a number is generated as the \texttt{label}, using the \texttt{enumi} counter. The \texttt{cite_key} is any sequence of letters, numbers, and punctuation symbols not containing a comma. This command writes an entry on the \texttt{.aux} file containing \texttt{cite_key} and the item's \texttt{label}. When this \texttt{.aux} file is read by the \texttt{\begin{document}} command, the item's \texttt{label} is associated with \texttt{cite_key}, causing the reference to \texttt{cite_key} by a \texttt{\cite} command to produce the associated \texttt{label}.

\subsection*{2.6.20.2 \texttt{\textbackslash cite}}

\begin{verbatim}
cite[text]{key_list}
\end{verbatim}

The \texttt{key_list} argument is a list of citation keys. This command generates an in-text citation to the references associated with the keys in \texttt{key_list} by entries on the \texttt{.aux} file read by the \texttt{\begin{document}} command.

The optional \texttt{text} argument will appear after the citation, i.e. \texttt{\cite[p. 2]{knuth}} might produce “[Knuth, p. 2]”. 


2.6.20.3 \nocite

\nocite{key_list}

The \nocite command produces no text, but writes key_list, which is a list of one or more citation keys, on the \'.aux' file.

2.6.20.4 Using BibTeX

If you use the BibTeX program by Oren Patashnik (highly recommended if you need a bibliography of more than a couple of titles) to maintain your bibliography, you don't use the \thebibliography environment. Instead, you include the lines

\bibliographystyle{style}
\bibliography{bibfile}

where style refers to a file style.bst, which defines how your citations will look. The standard styles distributed with BibTeX are:

- alpha: Sorted alphabetically. Labels are formed from name of author and year of publication.
- plain: Sorted alphabetically. Labels are numeric.
- unsrt: Like plain, but entries are in order of citation.
- abbr: Like plain, but more compact labels.

In addition, numerous other BibTeX style files exist tailored to the demands of various publications.

The argument to \bibliography refers to the file bibfile.bib, which should contain your database in BibTeX format. Only the entries referred to via \cite and \nocite will be listed in the bibliography.

2.6.21 theorem

\begin{theorem}
  theorem text
\end{theorem}

The theorem environment produces "Theorem x" in boldface followed by your theorem text.

2.6.22 titlepage

\begin{titlepage}
  text
\end{titlepage}

The titlepage environment creates a title page, i.e. a page with no printed page number or heading. It also causes the following page to be numbered page one. Formatting the title page is left to you. The \today command comes in handy for title pages.

Note that you can use the \maketitle (see Section 2.15.1 [\maketitle], page 40) command to produce a standard title page.
2.6.23 `verbatim`

\begin{verbatim}
  text
\end{verbatim}

The `verbatim` environment is a paragraph-making environment that gets LaTeX to print exactly what you type in. It turns LaTeX into a typewriter with carriage returns and blanks having the same effect that they would on a typewriter.

2.6.23.1 `\verb`

\verb char literal_text char
\verb*char literal_text char

Typesets `literal_text` exactly as typed, including special characters and spaces, using a typewriter (`tt`) type style. There may be no space between `\verb` or `\verb*` and `char` (space is shown here only for clarity). The `*`-form differs only in that spaces are printed as `\verb*| |`.

2.6.24 `verse`

\begin{verse}
  text
\end{verse}

The `verse` environment is designed for poetry, though you may find other uses for it.

The margins are indented on the left and the right. Separate the lines of each stanza with `\`, and use one or more blank lines to separate the stanzas.
2.7 Footnotes

Footnotes can be produced in one of two ways. They can be produced with one command, the \texttt{footnote} command. They can also be produced with two commands, the \texttt{footnotemark} and the \texttt{footnotetext} commands. See the specific command for information on why you would use one over the other.

2.7.1 \texttt{footnote}

\texttt{\footnote[number]{text}}

The \texttt{\footnote} command places the numbered footnote text at the bottom of the current page. The optional argument, \texttt{number}, is used to change the default footnote number. This command can only be used in outer paragraph mode; i.e., you cannot use it in sectioning commands like \texttt{chapter}, in figures, tables or in a \texttt{tabular} environment.

2.7.2 \texttt{footnotemark}

The \texttt{\footnotemark} command puts the footnote number in the text. This command can be used in inner paragraph mode. The text of the footnote is supplied by the \texttt{\footnotetext} command.

This command can be used to produce several consecutive footnote markers referring to the same footnote by using

\texttt{\footnotemark[\texttt{value\{footnote\}}]}

after the first \texttt{\footnote} command.

2.7.3 \texttt{footnotetext}

\texttt{\footnotetext[number]{text}}

The \texttt{\footnotetext} command produces the text to be placed at the bottom of the page. This command can come anywhere after the \texttt{\footnotemark} command. The \texttt{\footnotetext} command must appear in outer paragraph mode.

The optional argument, \texttt{number}, is used to change the default footnote number.
2.8 Lengths

A length is a measure of distance. Many LaTeX commands take a length as an argument.

2.8.1 \newlength

\newlength{\gna}\t
The \newlength command defines the mandatory argument, \gna, as a length command with a value of 0in. An error occurs if a \gna command already exists.

2.8.2 \setlength

\setlength{\gna}{\text{length}}
The \setlength command is used to set the value of a length command. The length argument can be expressed in any terms of length LaTeX understands, i.e., inches (in), millimetres (mm), points (pt), etc.

2.8.3 \addtolength

\addtolength{\gna}{\text{length}}
The \addtolength command increments a “length command” by the amount specified in the \text argument. It can be a negative amount.

2.8.4 \settodepth

\settodepth{\gna}{\text{text}}
The \settodepth command sets the value of a length command equal to the depth of the \text argument.

2.8.5 \settoheight

\settoheight{\gna}{\text{text}}
The \settoheight command sets the value of a length command equal to the height of the \text argument.

2.8.6 \settowidth

\settowidth{\gna}{\text{text}}
The \settowidth command sets the value of a length command equal to the width of the \text argument.
2.8.7 Predefined lengths

\width
\height
\depth
\totalheight

These length parameters can be used in the arguments of the box-making commands. See Section 2.17 [Spaces & Boxes], page 43. They specify the natural width etc. of the text in the box. \totalheight equals \height + \depth. To make a box with the text stretched to double the natural size, e.g., say:
\makebox[2\width]{Get a stretcher}

2.9 Letters

You can use LaTeX to typeset letters, both personal and business. The letter document class is designed to make a number of letters at once, although you can make just one if you so desire.

Your ‘.tex’ source file has the same minimum commands as the other document classes, i.e., you must have the following commands as a minimum:
\documentclass{letter}
\begin{document}
... letters ...
\end{document}

Each letter is a letter environment, whose argument is the name and address of the recipient. For example, you might have:
\begin{letter}{Mr. Joe Smith\ 2345 Princess St.\ \ Edinburgh, EH1 1AA}
...
\end{letter}

The letter itself begins with the \opening command. The text of the letter follows. It is typed as ordinary LaTeX input. Commands that make no sense in a letter, like \chapter, do not work. The letter closes with a \closing command.

After the closing, you can have additional material. The \cc command produces the usual “cc: ...”. There’s also a similar \encl command for a list of enclosures. With both these commands, use \ to separate the items.

These commands are used with the letter class:

2.9.1 \address

\address{Return address}

The return address, as it should appear on the letter and the envelope. Separate lines of the address should be separated by \ commands. If you do not make an \address declaration, then the letter will be formatted for copying onto your organisation’s standard letterhead. (See Chapter 1 [Overview], page 3, for details on your local implementation). If you give an \address declaration, then the letter will be formatted as a personal letter.
2.9.2 \cc
\cc{Kate Schechter\Rob McKenna}
Generate a list of other persons the letter was sent to. Each name is printed on a separate line.

2.9.3 \closing
\closing{text}
The letter closes with a \closing command, i.e.,
\closing{Best Regards,}

2.9.4 \encl
\encl{CV\Certificates}
Generate a list of enclosed material.

2.9.5 \location
\location{address}
This modifies your organisation's standard address. This only appears if the \firstpage pagestyle is selected.

2.9.6 \makelabels
\makelabels{number}
If you issue this command in the preamble, \LaTeX{} will create a sheet of address labels. This sheet will be output before the letters.

2.9.7 \name
\name{June Davenport}
Your name, used for printing on the envelope together with the return address.

2.9.8 \opening
\opening{text}
The letter begins with the \opening command. The mandatory argument, text, is whatever text you wish to start your letter, i.e.,
\opening{Dear Joe,}

2.9.9 \ps
\ps
Use this command before a postscript.
2.9.10 \signature

\signature{Harvey Swick}
Your name, as it should appear at the end of the letter underneath the space for your signature. Items that should go on separate lines should be separated by \commands.

2.9.11 \startbreaks

\startbreaks
Used after a \stopbreaks command to allow page breaks again.

2.9.12 \stopbreaks

\stopbreaks
Inhibit page breaks until a \startbreaks command occurs.

2.9.13 \telephone

\telephone{number}
This is your telephone number. This only appears if the \firstpage pagestyle is selected.
2.10 Line & Page Breaking

The first thing LaTeX does when processing ordinary text is to translate your input file into a string of glyphs and spaces. To produce a printed document, this string must be broken into lines, and these lines must be broken into pages. In some environments, you do the line breaking yourself with the `\` command, but LaTeX usually does it for you.

2.10.1 `\`

`\[*] [extra-space]`

The `\` command tells LaTeX to start a new line. It has an optional argument, *extra-space*, that specifies how much extra vertical space is to be inserted before the next line. This can be a negative amount.

The `\*` command is the same as the ordinary `\` command except that it tells LaTeX not to start a new page after the line.

2.10.2 `\-`

The `\-` command tells LaTeX that it may hyphenate the word at that point. LaTeX is very good at hyphenating, and it will usually find all correct hyphenation points. The `\-` command is used for the exceptional cases.

Note that when you insert `\-` commands in a word, the word will only be hyphenated at those points and not at any of the hyphenation points that LaTeX might otherwise have chosen.

2.10.3 `\cleardoublepage`

The `\cleardoublepage` command ends the current page and causes all figures and tables that have so far appeared in the input to be printed. In a two-sided printing style, it also makes the next page a right-hand (odd-numbered) page, producing a blank page if necessary.

2.10.4 `\clearpage`

The `\clearpage` command ends the current page and causes all figures and tables that have so far appeared in the input to be printed.

2.10.5 `\enlargethispage`

`\enlargethispage{size}`

`\enlargethispage*{size}`

Enlarges the `\textwidth` for the current page by the specified amount; e.g. `\enlargethispage{\baselineskip}` will allow one additional line.

The starred form tries to squeeze the material together on the page as much as possible. This is normally used together with an explicit `\pagebreak`.
2.10.6 \fussy

\fussy
This declaration (which is the default) makes \LaTeX{} more fussy about line breaking. This
can avoids too much space between words, but may produce overfull boxes.

This command cancels the effect of a previous \slippy command. Section 2.10.14 \slippy, page 34

2.10.7 \hyphenation

\hyphenation{words}
The \hyphenation command declares allowed hyphenation points, where \texttt{words} is a list
of words, separated by spaces, in which each hyphenation point is indicated by a – character.

2.10.8 \linebreak

\linebreak[\texttt{number}]
The \linebreak command tells \LaTeX{} to break the current line at the point of the
command. With the optional argument, \texttt{number}, you can convert the \linebreak command
from a demand to a request. The number must be a number from 0 to 4. The higher the
number, the more insistent the request is.

The \linebreak command causes \LaTeX{} to stretch the line so it extends to the right
margin.

2.10.9 \newline

The \newline command breaks the line right where it is. It can only be used in para-
graph mode.

2.10.10 \newpage

The \newpage command ends the current page.

2.10.11 \nolinebreak

\nolinebreak[\texttt{number}]
The \nolinebreak command prevents \LaTeX{} from breaking the current line at the point
of the command. With the optional argument, \texttt{number}, you can convert the \nolinebreak
command from a demand to a request. The number must be a number from 0 to 4. The higher the
number, the more insistent the request is.

2.10.12 \nopagebreak

\nopagebreak[\texttt{number}]
The \nopagebreak command prevents \LaTeX{} from breaking the current page at the
point of the command. With the optional argument, \texttt{number}, you can convert the
\nopagebreak command from a demand to a request. The number must be a number from
0 to 4. The higher the number, the more insistent the request is.
2.10.13 \pagebreak

\pagebreak [number]

The \pagebreak command tells LaTeX to break the current page at the point of the command. With the optional argument, number, you can convert the \pagebreak command from a demand to a request. The number must be a number from 0 to 4. The higher the number, the more insistent the request is.

2.10.14 \sloppy

\sloppy

This declaration makes TeX less fussy about line breaking. This can prevent overfull boxes, but may leave too much space between words.

Lasts until a \fussy command is issued. Section 2.10.6 [\fussy], page 33.
2.11 Making Paragraphs

A paragraph is ended by one or more completely blank lines — lines not containing even a \%. A blank line should not appear where a new paragraph cannot be started, such as in math mode or in the argument of a sectioning command.

2.11.1 \indent

\indent

This produces a horizontal space whose width equals the width of the paragraph indentation. It is used to add paragraph indentation where it would otherwise be suppressed.

2.11.2 \noindent

\noindent

When used at the beginning of the paragraph, it suppresses the paragraph indentation. It has no effect when used in the middle of a paragraph.

2.11.3 \par

Equivalent to a blank line; often used to make command or environment definitions easier to read.
2.12 Margin Notes

The command `\marginpar[left]{right}` creates a note in the margin. The first line will be at the same height as the line in the text where the `\marginpar` occurs.

When you only specify the mandatory argument `right`, the text will be placed
- in the right margin for one-sided layout
- in the outside margin for two-sided layout
- in the nearest margin for two-column layout.

By issuing the command `\reversemarginpar`, you can force the marginal notes to go into the opposite (inside) margin.

When you specify both arguments, `left` is used for the left margin, and `right` is used for the right margin.

The first word will normally not be hyphenated; you can enable hyphenation by prefixing the first word with a `\hspace{0pt}` command.

2.13 Math Formulae

There are three environments that put LaTeX in math mode:

- `math` For Formulae that appear right in the text.
- `displaymath` For Formulae that appear on their own line.
- `equation` The same as the `displaymath` environment except that it adds an equation number in the right margin.

The `math` environment can be used in both paragraph and LR mode, but the `displaymath` and `equation` environments can be used only in paragraph mode. The `math` and `displaymath` environments are used so often that they have the following short forms:

```
\(...\) instead of \begin{math}\end{math}

\[\ldots\] instead of \begin{displaymath}\end{displaymath}
```

In fact, the `math` environment is so common that it has an even shorter form:

```
$\ldots$ instead of \(...\)
```

### 2.13.1 Subscripts & Superscripts

To get an expression `exp` to appear as a subscript, you just type `_{exp}`. To get `exp` to appear as a superscript, you type `^{exp}`. LaTeX handles superscripted superscripts and all of that stuff in the natural way. It even does the right thing when something has both a subscript and a superscript.

### 2.13.2 Math Symbols

LaTeX provides almost any mathematical symbol you’re likely to need. The commands for generating them can be used only in math mode. For example, if you include `$\pi$` in your source, you will get the symbol \( \pi \) in your output.
2.13.3 Spacing in Math Mode

In a math environment, LaTeX ignores the spaces you type and puts in the spacing that it thinks is best. LaTeX formats mathematics the way it’s done in mathematics texts. If you want different spacing, LaTeX provides the following four commands for use in math mode:
1. \; - a thick space
2. \, - a medium space
3. \, - a thin space
4. \! - a negative thin space

2.13.4 Math Miscellany

\cdots Produces a horizontal ellipsis where the dots are raised to the centre of the line.
\eg \ldots
\ddots Produces a diagonal ellipsis.
\eg \ldots
\frac{\text{num}}{\text{den}} Produces the fraction \text{num} divided by \text{den}.
\eg \frac{1}{4}
\ldots Produces an ellipsis. This command works in any mode, not just math mode.
\eg \ldots
\overbrace{\text{text}} Generates a brace over text.
\eg \overbrace{x + \ldots + x}^{k \text{ times}}
\underline{\text{text}} Causes the argument text to be underlined.
\eg \underline{x}
\sqrt{\text{root}}\{\text{arg}} Produces the square root of its argument. The optional argument, \text{root}, determines what root to produce, i.e., the cube root of \text{x+y} would be typed as $\sqrt[3]{x+y}$.
\eg \sqrt{x-1}
\underbrace{\text{text}} Generates text with a brace underneath.
\eg \underbrace{x + y + z}_{> 0}
\underline{\text{text}} Causes the argument text to be underlined. This command can also be used in paragraph and LR modes.
\eg \underline{z}
\vdots \quad \text{Produces a vertical ellipsis.}

e.g. \quad \vdots
2.14 Modes

When LaTeX is processing your input text, it is always in one of three modes:

- Paragraph mode
- Math mode
- Left-to-right mode, called LR mode for short

LaTeX changes mode only when it goes up or down a staircase to a different level, though not all level changes produce mode changes. Mode changes occur only when entering or leaving an environment, or when LaTeX is processing the argument of certain text-producing commands.

“Paragraph mode” is the most common; it’s the one LaTeX is in when processing ordinary text. In that mode, LaTeX breaks your text into lines and breaks the lines into pages. LaTeX is in “math mode” when it’s generating a mathematical formula. In “LR mode”, as in paragraph mode, LaTeX considers the output that it produces to be a string of words with spaces between them. However, unlike paragraph mode, LaTeX keeps going from left to right; it never starts a new line in LR mode. Even if you put a hundred words into an \texttt{\textbackslash\texttt{mbox}}, LaTeX would keep typesetting them from left to right inside a single box, and then complain because the resulting box was too wide to fit on the line.

LaTeX is in LR mode when it starts making a box with an \texttt{\textbackslash\texttt{mbox}} command. You can get it to enter a different mode inside the box - for example, you can make it enter math mode to put a formula in the box. There are also several text-producing commands and environments for making a box that put LaTeX in paragraph mode. The box made by one of these commands or environments will be called a \texttt{\textbackslash\texttt{parbox}}. When LaTeX is in paragraph mode while making a box, it is said to be in “inner paragraph mode”. Its normal paragraph mode, which it starts out in, is called “outer paragraph mode”.

2.15 Page Styles

The \documentclass command determines the size and position of the page’s head and foot. The page style determines what goes in them.

2.15.1 \maketitle

\maketitle

The \maketitle command generates a title on a separate title page - except in the \texttt{article} class, where the title normally goes at the top of the first page. Information used to produce the title is obtained from the following declarations:

See Section 2.15 [Page Styles], page 40 for the commands to give the information.

2.15.2 \author

\author{names}

The \texttt{author} command declares the author(s), where \texttt{names} is a list of authors separated by \texttt{and} commands. Use \\
 to separate lines within a single author’s entry – for example, to give the author’s institution or address.

2.15.3 \date

\date{text}

The \texttt{date} command declares \texttt{text} to be the document’s date. With no \texttt{date} command, the current date is used.

2.15.4 \thanks

\thanks{text}

The \texttt{thanks} command produces a \footnote to the title.

2.15.5 \title

\title{text}

The \texttt{title} command declares \texttt{text} to be the title. Use \\
 to tell LaTeX where to start a new line in a long title.

2.15.6 \pagenumbering

\pagenumbering{num_style}

Specifies the style of page numbers. Possible values of \texttt{num_style} are:

- \texttt{arabic} - Arabic numerals
- \texttt{roman} - Lowercase Roman numerals
- \texttt{Roman} - Uppercase Roman numerals
- \texttt{alph} - Lowercase letters
- \texttt{Alph} - Uppercase letters
2.15.7 \pagestyle

\pagestyle{option}

The \pagestyle command changes the style from the current page on throughout the remainder of your document.

The valid options are:
- plain - Just a plain page number.
- empty - Produces empty heads and feet - no page numbers.
- headings - Puts running headings on each page. The document style specifies what goes in the headings.
- myheadings - You specify what is to go in the heading with the \markboth or the \markright commands.

2.15.8 \markboth

\markboth{left head}{right head}

The \markboth command is used in conjunction with the page style myheadings for setting both the left and the right heading. You should note that a “left-hand heading” is generated by the last \markboth command before the end of the page, while a “right-hand heading” is generated by the first \markboth or \markright that comes on the page if there is one, otherwise by the last one before the page.

2.15.9 \markright

\markright{right head}

The \markright command is used in conjunction with the page style myheadings for setting the right heading, leaving the left heading unchanged. You should note that a “left-hand heading” is generated by the last \markboth command before the end of the page, while a “right-hand heading” is generated by the first \markboth or \markright that comes on the page if there is one, otherwise by the last one before the page.

2.15.10 \thispagestyle

\thispagestyle{option}

The \thispagestyle command works in the same manner as the \pagestyle command except that it changes the style for the current page only.
2.16 Sectioning

Sectioning commands provide the means to structure your text into units.

- \part
- \chapter (report and book class only)
- \section
- \subsection
- \subsubsection
- \paragraph
- \subparagraph

All sectioning commands take the same general form, i.e.,

\chapter[optional]{title}

In addition to providing the heading in the text, the mandatory argument of the sectioning command can appear in two other places:
1. The table of contents
2. The running head at the top of the page

You may not want the same thing to appear in these other two places as appears in the text heading. To handle this situation, the sectioning commands have an \texttt{optional} argument that provides the text for these other two purposes.

All sectioning commands have \texttt{*}-forms that print a \texttt{title}, but do not include a number and do not make an entry in the table of contents.

\appendix

The \appendix command changes the way sectional units are numbered. The \appendix command generates no text and does not affect the numbering of parts. The normal use of this command is something like

\chapter{The First Chapter}
...
\appendix
\chapter{The First Appendix}
2.17 Spaces & Boxes

All the predefined length parameters See Section 2.8.7 [Predefined lengths], page 29 can be used in the arguments of the box-making commands.

2.17.1 \dotfill

The \dotfill command produces a “rubber length” that produces dots instead of just spaces.

2.17.2 \hfill

The \hfill fill command produces a “rubber length” which can stretch or shrink horizontally. It will be filled with spaces.

2.17.3 \hrulefill

The \hrulefill fill command produces a “rubber length” which can stretch or shrink horizontally. It will be filled with a horizontal rule.

2.17.4 \hspace

\hspace[\*]{length}

The \hspace command adds horizontal space. The length of the space can be expressed in any terms that LaTeX understands, i.e., points, inches, etc. You can add negative as well as positive space with an \hspace command. Adding negative space is like backspacing.

LaTeX removes horizontal space that comes at the end of a line. If you don’t want LaTeX to remove this space, include the optional * argument. Then the space is never removed.

2.17.5 \addvspace

\addvspace{length}

The \addvspace command normally adds a vertical space of height \texttt{length}. However, if vertical space has already been added to the same point in the output by a previous \addvspace command, then this command will not add more space than needed to make the natural length of the total vertical space equal to \texttt{length}.

2.17.6 \bigskip

The \bigskip command is equivalent to \texttt{vspace\{bigskipamount\}} where \texttt{bigskipamount} is determined by the document class.

2.17.7 \medskip

The \medskip command is equivalent to \texttt{vspace\{medskipamount\}} where \texttt{medskipamount} is determined by the document class.
2.17.8 \smallskip

\smallskip
The \smallskip command is equivalent to \vspace{smallskipamount} where smallskipamount is determined by the document class.

2.17.9 \vfill

The \vfill fill command produces a rubber length which can stretch or shrink vertically.

2.17.10 \vspace

\vspace[\*][\textwidth]
The \vspace command adds vertical space. The length of the space can be expressed in any terms that \LaTeX{} understands, i.e., points, inches, etc. You can add negative as well as positive space with an \vspace command.
\LaTeX{} removes vertical space that comes at the end of a page. If you don't want \LaTeX{} to remove this space, include the optional \footnotesize argument. Then the space is never removed.

2.17.11 \fbox

\fbox{\textwidth}
The \fbox command is exactly the same as the \hbox command, except that it puts a frame around the outside of the box that it creates.

2.17.12 \framebox

\framebox[\textwidth][\textwidth]\textwidth
The \framebox command is exactly the same as the \makebox command, except that it puts a frame around the outside of the box that it creates.

The \framebox command produces a rule of thickness \fboxrule, and leaves a space \fboxsep between the rule and the contents of the box.

2.17.13 lrbox

\begin{lrbox}{\textwidth}\textwidth\end{lrbox}
This is the environment form of \hbox.
The text inside the environment is saved in the box \textwidth, which must have been declared with \newsavebox.

2.17.14 \makebox

\makebox[\textwidth][\textwidth]\textwidth
The \makebox command creates a box just wide enough to contain the text specified. The width of the box is specified by the optional \textwidth argument. The position of the text within the box is determined by the optional \position argument.
2.17.15 \mbox

\mbox{text}

The \mbox command creates a box just wide enough to hold the text created by its argument.

Use this command to prevent text from being split across lines.

2.17.16 \newsavebox

\newsavebox{cmd}

Declares cmd, which must be a command name that is not already defined, to be a bin for saving boxes.

2.17.17 \parbox

\parbox[position][height][inner-pos]{width}{text}

A \parbox is a box whose contents are created in paragraph mode. The \parbox has two mandatory arguments:

- \textwidth - specifies the width of the parbox, and
- \text - the text that goes inside the parbox.

LaTeX will position a \parbox so its centre lines up with the centre of the text line. The optional \textposition argument allows you to line up either the top or bottom line in the parbox (default is top).

If the \textheight argument is not given, the box will have the natural height of the text.

The \textinnerpos argument controls the placement of the text inside the box. If it is not specified, \textposition is used.

- t — text is placed at the top of the box.
- c — text is centred in the box.
- b — text is placed at the bottom of the box.
- s — stretch vertically. The text must contain vertically stretchable space for this to work.

A \parbox command is used for a parbox containing a small piece of text, with nothing fancy inside. In particular, you shouldn’t use any of the paragraph-making environments inside a \parbox argument. For larger pieces of text, including ones containing a paragraph-making environment, you should use a \minipage environment See Section 2.6.13 [minipage], page 16.
2.17.18 \raisebox

\raisebox{distance}[extend-above][extend-below]{text}

The \raisebox command is used to raise or lower text. The first mandatory argument specifies how high the text is to be raised (or lowered if it is a negative amount). The text itself is processed in LR mode.

Sometimes it’s useful to make LaTeX think something has a different size than it really does - or a different size than LaTeX would normally think it has. The \raisebox command lets you tell LaTeX how tall it is.

The first optional argument, extend-above, makes LaTeX think that the text extends above the line by the amount specified. The second optional argument, extend-below, makes LaTeX think that the text extends below the line by the amount specified.

2.17.19 \rule

\rule[raise-height]{width}{thickness}

The \rule command is used to produce horizontal lines. The arguments are defined as follows:

- raise-height - specifies how high to raise the rule (optional)
- width - specifies the length of the rule (mandatory)
- thickness - specifies the thickness of the rule (mandatory)

2.17.20 \savebox

\savebox{cmd}[width][pos]{text}

This command typeset text in a box just as for \makebox. However, instead of printing the resulting box, it saves it in bin cmd, which must have been declared with \newsavebox.

2.17.21 \sbox

\sbox{text}

This commands typeset text in a box just as for \mbox. However, instead of printing the resulting box, it saves it in bin cmd, which must have been declared with \newsavebox.

2.17.22 \usebox

\usebox{cmd}

Prints the box most recently saved in bin cmd by a \savebox command.
2.18 Special Characters

The following characters play a special role in LaTeX and are called “special printing characters”, or simply “special characters”.

```
# $ % & _ ~ \ { }
```

Whenever you put one of these special characters into your file, you are doing something special. If you simply want the character to be printed just as any other letter, include a \ in front of the character. For example, \$ will produce $ in your output.

One exception to this rule is the \ itself because \ has its own special meaning. A \ is produced by typing \textbackslash\ in your file.

Also, \^ means ‘place a tilde accent over the following letter’, so you will probably want to use \verb instead.

In addition, you can access any character of a font once you know its number by using the \symbol command. For example, the character used for displaying spaces in the \verb* command has the code decimal 32, so it can be typed as \symbol{32}.

You can also specify octal numbers with ' or hexadecimal numbers with ", so the previous example could also be written as \symbol{\textasciitilde40} or \symbol{"20}.

2.19 Splitting the Input

A large document requires a lot of input. Rather than putting the whole input in a single large file, it’s more efficient to split it into several smaller ones. Regardless of how many separate files you use, there is one that is the root file; it is the one whose name you type when you run LaTeX.

2.19.1 \include

\include{file}

The \include command is used in conjunction with the \includeonly command for selective inclusion of files. The file argument is the first name of a file, denoting ‘file.tex’. If file is one of the file names in the file list of the \includeonly command or if there is no \includeonly command, the \include command is equivalent to

```
\clearpage \input{file} \clearpage
```

except that if the file ‘file.tex’ does not exist, then a warning message rather than an error is produced. If the file is not in the file list, the \include command is equivalent to \clearpage.

The \include command may not appear in the preamble or in a file read by another \include command.

2.19.2 \includeonly

\includeonly{file_list}

The \includeonly command controls which files will be read in by an \include command. file_list should be a comma-separated list of filenames. Each filename must match exactly a filename specified in a \include command. This command can only appear in the preamble.
2.19.3 \input

\input{file}

The \input command causes the indicated file to be read and processed, exactly as if its contents had been inserted in the current file at that point. The file name may be a complete file name with extension or just a first name, in which case the file ‘file.tex’ is used.
2.20 Starting & Ending

Your input file must contain the following commands as a minimum:

\documentclass{class}
\begin{document}
... your text goes here ...
\end{document}

where the class selected is one of the valid classes for \LaTeX. See Section 2.4 [Document Classes], page 10 (and see Chapter 1 [Overview], page 3), for details of the various document classes available locally.

You may include other \LaTeX commands between the \documentclass and the \begin{document} commands (i.e., in the ‘preamble’).
2.21 Table of Contents

A table of contents is produced with the \tableofcontents command. You put the command right where you want the table of contents to go; LaTeX does the rest for you. It produces a heading, but it does not automatically start a new page. If you want a new page after the table of contents, include a \newpage command after the \tableofcontents command.

There are similar commands \listoffigures and \listoftables for producing a list of figures and a list of tables, respectively. Everything works exactly the same as for the table of contents.

NOTE: If you want any of these items to be generated, you cannot have the \nofiles command in your document.

2.21.1 \addcontentsline

\addcontentsline{file}{sec_unit}{entry}

The \addcontentsline command adds an entry to the specified list or table where:

- \texttt{file} is the extension of the file on which information is to be written: toc (table of contents), lof (list of figures), or lot (list of tables).
- \texttt{sec_unit} controls the formatting of the entry. It should be one of the following, depending upon the value of the file argument:
  1. toc — the name of the sectional unit, such as part or subsection.
  2. lof — figure
  3. lot — table
- \texttt{entry} is the text of the entry.

2.21.2 \addtocontents

\addtocontents{file}{text}

The \addtocontents command adds text (or formatting commands) directly to the file that generates the table of contents or list of figures or tables.

- \texttt{file} is the extension of the file on which information is to be written: toc (table of contents), lof (list of figures), or lot (list of tables).
- \texttt{text} is the information to be written.
2.22 Terminal Input/Output

2.22.1 \typein

\typein[cmd]{msg}

Prints msg on the terminal and causes \LaTeX{} to stop and wait for you to type a line of input, ending with return. If the cmd argument is missing, the typed input is processed as if it had been included in the input file in place of the \typein command. If the cmd argument is present, it must be a command name. This command name is then defined or redefined to be the typed input.

2.22.2 \typeout

\typeout{msg}

Prints msg on the terminal and in the log file. Commands in msg that are defined with \newcommand or \renewcommand are replaced by their definitions before being printed.

\LaTeX{}'s usual rules for treating multiple spaces as a single space and ignoring spaces after a command name apply to msg. A \space command in msg causes a single space to be printed. A \textasciitilde\textasciitilde\textasciitilde J in msg prints a newline.
2.23 Typefaces

The **typeface** is specified by giving the "size" and "style". A typeface is also called a "font".

2.23.1 \textit{\textbf{\texttt{\textsl{\textsc{\texttt{\textnormal}}}}}}

The following type style commands are supported by LaTeX.

These commands are used like \textit{\textbf{\texttt{\textsl{\textsc{\texttt{\textnormal}}}}}}. The corresponding command in parenthesis is the "declaration form", which takes no arguments. The scope of the declaration form lasts until the next type style command or the end of the current group.

The declaration forms are cumulative; i.e., you can say \textit{\textbf{\texttt{\textsl{\textsc{\texttt{\textnormal}}}}}} to get sans serif boldface.

You can also use the environment form of the declaration forms; e.g. \begin{ttfamily}{...}...\end{ttfamily}

\texttt{\textnormal{\texttt{\textbf{\textsc{\texttt{\textsl{\textit{}}}}}}}}

Roman.

\texttt{\textit{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}

Emphasis (toggles between \textit and \texttt{\textbf{\textsc{\texttt{\textnormal}}}}).

\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}

Medium weight (default). The opposite of boldface.

\texttt{\textbf{\textsc{\texttt{\textnormal}}}}

Boldface.

\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}

Upright (default). The opposite of slanted.

\texttt{\texttt{\textsl{\texttt{\textnormal}}}}

Slanted.

\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}

Sans serif.

\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}

Small caps.

\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}

Typewriter.

\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}}

Main document font.

\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}}}

Roman, for use in math mode.

\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}}}}

Boldface, for use in math mode.

\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}}}}}

Sans serif, for use in math mode.

\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}}}}}}

Typewriter, for use in math mode.

\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\texttt{\textbf{\textsc{\texttt{\textnormal}}}}}}}}}}}}}}

Italics, for use in math mode, e.g. variable names with several letters.
\texttt{\textbackslash mathnormal}

For use in math mode, e.g. inside another type style declaration.

\texttt{\textbackslash mathcal}

`Calligraphic' letters, for use in math mode.

In addition, the command \texttt{\textbackslash mathversion\{bold\}} can be used for switching to bold letters and symbols in formulas. \texttt{\textbackslash mathversion\{normal\}} restores the default.

### 2.23.2 Sizes

The following standard type size commands are supported by LaTeX.

The commands as listed here are "declaration forms". The scope of the declaration form lasts until the next type style command or the end of the current group.

You can also use the environment form of these commands; e.g. \texttt{\begin{tiny}...\end{tiny}}.

\texttt{\textbackslash tiny}

\texttt{\textbackslash scriptsize}

\texttt{\textbackslash footnotesize}

\texttt{\textbackslash small}

\texttt{\textbackslash normalsize}

\hspace{1em} (default)

\texttt{\textbackslash large}

\texttt{\textbackslash Large}

\texttt{\textbackslash LARGE}

\texttt{\textbackslash huge}

\texttt{\textbackslash Huge}

### 2.23.3 Low-level font commands

These commands are primarily intended for writers of macros and packages. The commands listed here are only a subset of the available ones. For full details, you should consult Chapter 7 of The LaTeX Companion.

\texttt{\textbackslash fontencoding\{enc\}}

Select font encoding. Valid encodings include 0T1 and T1.

\texttt{\textbackslash fontfamily\{family\}}

Select font family. Valid families include:

- \texttt{cmr} for Computer Modern Roman
- \texttt{cmss} for Computer Modern Sans Serif
- \texttt{cmtt} for Computer Modern Typewriter

and numerous others.

\texttt{\textbackslash fontseries\{series\}}

Select font series. Valid series include:
- m Medium (normal)
- b Bold
- c Condensed
- bc Bold condensed
- bx Bold extended

and various other combinations.

\fontshape\{shape\}
Select font shape. Valid shapes are:
- n Upright (normal)
- it Italic
- s1 Slanted (oblique)
- sc Small caps
- ui Upright italics
- o1 Outline

The two last shapes are not available for most font families.

\fontsize\{size\}\{skip\}
Set font size. The first parameter is the font size to switch to; the second is the \baselineskip to use. The unit of both parameters defaults to pt. A rule of thumb is that the baselineskip should be 1.2 times the font size.

\selectfont
The changes made by calling the four font commands described above do not come into effect until \selectfont is called.

\usefont\{enc\}\{family\}\{series\}\{shape\}
Equivalent to calling \fontencoding, \fontfamily, \fontseries and \fontshape with the given parameters, followed by \selectfont.
3 Parameters

The input file specification indicates the file to be formatted; TeX uses `.tex` as a default file extension. If you omit the input file entirely, TeX accepts input from the terminal. You specify command options by supplying a string as a parameter to the command; e.g.

```latex
\latex \text{"\textbackslash scrollmode\input foo.tex"}
```

will process `foo.tex` without pausing after every error.

Output files are always created in the current directory. When you fail to specify an input file name, TeX bases the output names on the file specification associated with the logical name `TEX_OUTPUT`, typically `texput.log`. 
# Concept Index

## A
- Accessing any character of a font ........................................ 47
- Aligning Equations ......................................................... 13
- Appendix, creating .......................................................... 42
- Arrays, math ................................................................. 12
- article class ................................................................. 10
- Author, for titlepage ....................................................... 40

## B
- Bibliography, creating (automatically) ................................. 25
- Bibliography, creating (manually) ....................................... 24
- Bib/Tex, using ............................................................... 25
- book class ................................................................. 10
- Boxes ........................................................................... 43

## C
- Cc list ............................................................................ 30
- Centering text .............................................................. 12
- Centering text, environment for ...................................... 12
- Characters, reserved ...................................................... 47
- Characters, special ........................................................ 47
- Classes of document ...................................................... 10
- Commands, defining new ones ......................................... 8
- Computer programs, typesetting ...................................... 26
- Counters, a list of .......................................................... 5
- Counters, creating ........................................................ 6
- Counters, getting the value of ......................................... 6
- Counters, setting .......................................................... 6
- Creating letters ............................................................ 29
- Creating pictures .......................................................... 17
- Creating tables ............................................................ 22
- Cross referencing ......................................................... 7
- Cross referencing using page number ............................... 7
- Cross referencing using section number ............................ 7

## D
- Date, for titlepage .......................................................... 40
- Defining a new command ................................................ 8
- Defining new environments ............................................. 8
- Defining new fonts ........................................................ 9
- Defining new theorems ................................................... 9
- Displaying quoted text .................................................... 20
- Displaying quoted text with paragraph indentation ............. 20
- Document Classes ......................................................... 10

## E
- Enclosed material .......................................................... 30
- Ending & Starting .......................................................... 49
- Enlarge current page ...................................................... 32
- Environments .............................................................. 12
- Environments, defining ............................................... 8
- Equations, aligning ....................................................... 13
- Equations, environment for .......................................... 14
- exponent ................................................................. 36

## F
- Figures, footnotes in ....................................................... 16
- Flushing a page ............................................................ 32
- Font commands, low-level .............................................. 53
- Font Sizes ................................................................. 53
- Font Styles .................................................................... 52
- Fonts ............................................................................ 52
- Fonts, new commands for .............................................. 9
- Footnotes in figures ....................................................... 16
- Footnotes, creating ....................................................... 27
- Formatting Text ............................................................ 12
- Formulae, environment for .......................................... 14
- Formulae, maths ........................................................ 36

## G
- Global options .............................................................. 10
- Greek letters .............................................................. 36

## H
- Hyphenation, defining ................................................... 33
- Hyphenation, forcing .................................................... 32

## I
- Indent, forcing ............................................................. 35
- Indent, suppressing ...................................................... 35
- Input file, splitting ........................................................ 47
- Input/Output ............................................................... 51
- Inserting figures .......................................................... 14

## J
- Justification, ragged left ............................................... 15
- Justification, ragged right .............................................. 15

## L
- Labelled lists, creating ................................................... 13
- Latex overview .......................................................... 3
<table>
<thead>
<tr>
<th>Command</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout commands</td>
<td>10</td>
</tr>
<tr>
<td>Left-justifying text</td>
<td>15</td>
</tr>
<tr>
<td>Left-justifying text, environment for</td>
<td>14</td>
</tr>
<tr>
<td>Left-to-right mode</td>
<td>39</td>
</tr>
<tr>
<td>Lengths, adding to</td>
<td>28</td>
</tr>
<tr>
<td>Lengths, defining a new</td>
<td>28</td>
</tr>
<tr>
<td>Lengths, defining and using</td>
<td>28</td>
</tr>
<tr>
<td>Lengths, predefined</td>
<td>29</td>
</tr>
<tr>
<td>Lengths, setting value of</td>
<td>28</td>
</tr>
<tr>
<td>Letter class</td>
<td>10</td>
</tr>
<tr>
<td>Letters</td>
<td>29</td>
</tr>
<tr>
<td>Letters, ending</td>
<td>30</td>
</tr>
<tr>
<td>Letters, starting</td>
<td>30</td>
</tr>
<tr>
<td>Line Breaking</td>
<td>32</td>
</tr>
<tr>
<td>Line breaks</td>
<td>33</td>
</tr>
<tr>
<td>Lines in tables</td>
<td>22</td>
</tr>
<tr>
<td>Lining text up in columns using tab stops</td>
<td>20</td>
</tr>
<tr>
<td>Lining text up in tables</td>
<td>22</td>
</tr>
<tr>
<td>Lists of items</td>
<td>15</td>
</tr>
<tr>
<td>Lists of items, generic</td>
<td>16</td>
</tr>
<tr>
<td>Lists of items, numbered</td>
<td>13</td>
</tr>
<tr>
<td>Loading additional packages</td>
<td>10</td>
</tr>
<tr>
<td>Low-level font commands</td>
<td>53</td>
</tr>
<tr>
<td>LR mode</td>
<td>39</td>
</tr>
</tbody>
</table>

**P**

- Packages, loading | 10 |
- Page break, forcing | 34 |
- Page Breaking | 32 |
- Page Formatting | 32 |
- Page numbering | 40 |
- Page styles | 40 |
- Paragraph mode | 39 |
- Paragraph, starting a new | 35 |
- Paragraphs | 35 |
- Pictures, creating | 17 |
- Poetry, an environment for | 26 |
- Predefined lengths | 29 |
- Programs, typesetting | 26 |

**Q**

- Quoted text with paragraph indentation, displaying | 20 |
- Quoted text, displaying | 20 |

**R**

- Ragged left text | 15 |
- Ragged left text, environment for | 15 |
- Ragged right text | 15 |
- Ragged right text, environment for | 14 |
- Remarks in the margin | 36 |
- Report class | 10 |
- Reserved Characters | 47 |
- Right-justifying text | 15 |
- Right-justifying text, environment for | 15 |

**S**

- Sectioning | 42 |
- Simulating typed text | 26 |
- Sizes of text | 53 |
- Space, inserting vertical | 43 |
- Spaces | 43 |
- Spacing, within Math mode | 37 |
- Special Characters | 47 |
- Splitting the input file | 47 |
- Starting & Ending | 49 |
- Starting on a right-hand page | 32 |
- Styles of text | 52 |
- Styles, page | 40 |
- Subscript | 36 |
- Superscript | 36 |
- Symbols | 36 |

**T**

- Tab stops, using | 20 |
Table of Contents, creating ................. 50
Tables, creating ................................ 22
Terminal Input/Output ............................ 51
Thanks, for titlepage ............................ 40
Theorems, defining .............................. 9
Theorems, typesetting .......................... 25
Title making ................................... 40
Title pages, creating .......................... 25
Title, for titlepage .............................. 40
Typed text, simulating ......................... 26
Typeface Sizes ................................ 53

Typeface Styles ................................ 52
Typefaces ..................................... 52

U
Using BibTeX ................................... 25

V
Variables, a list of .............................. 5
Verbatim text .................................. 26
Vertical space, inserting ....................... 43
## Command Index

<table>
<thead>
<tr>
<th>Command</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>61</td>
</tr>
<tr>
<td>$</td>
<td>36</td>
</tr>
<tr>
<td>-</td>
<td>36</td>
</tr>
<tr>
<td>^</td>
<td>36</td>
</tr>
<tr>
<td>|</td>
<td>37</td>
</tr>
<tr>
<td>/ (tabbing)</td>
<td>21</td>
</tr>
<tr>
<td>( (tabbing)</td>
<td>36</td>
</tr>
<tr>
<td>}</td>
<td>36</td>
</tr>
<tr>
<td>&lt;</td>
<td>37</td>
</tr>
<tr>
<td>&gt;</td>
<td>20</td>
</tr>
<tr>
<td>|</td>
<td>36</td>
</tr>
<tr>
<td>_</td>
<td>21</td>
</tr>
<tr>
<td>+</td>
<td>21</td>
</tr>
<tr>
<td>%</td>
<td>20</td>
</tr>
<tr>
<td>\a</td>
<td>20</td>
</tr>
<tr>
<td>\addcontentsline</td>
<td>50</td>
</tr>
<tr>
<td>\address</td>
<td>29</td>
</tr>
<tr>
<td>\addcontents</td>
<td>50</td>
</tr>
<tr>
<td>\addtocounter</td>
<td>5</td>
</tr>
<tr>
<td>\adtolist</td>
<td>28</td>
</tr>
<tr>
<td>\addvspace</td>
<td>43</td>
</tr>
<tr>
<td>\alpha</td>
<td>5</td>
</tr>
<tr>
<td>\Alph</td>
<td>5</td>
</tr>
<tr>
<td>\appendix</td>
<td>42</td>
</tr>
<tr>
<td>\arabic</td>
<td>5</td>
</tr>
<tr>
<td>\author</td>
<td>40</td>
</tr>
<tr>
<td>\backslash</td>
<td>47</td>
</tr>
<tr>
<td>\begin</td>
<td>12</td>
</tr>
<tr>
<td>\bfseries</td>
<td>52</td>
</tr>
<tr>
<td>\bibitem</td>
<td>24</td>
</tr>
<tr>
<td>\bibliography</td>
<td>25</td>
</tr>
<tr>
<td>\bibliographystyle</td>
<td>25</td>
</tr>
<tr>
<td>\bigskip</td>
<td>43</td>
</tr>
<tr>
<td>\caption</td>
<td>14</td>
</tr>
<tr>
<td>\cc</td>
<td>30</td>
</tr>
<tr>
<td>\cdots</td>
<td>37</td>
</tr>
<tr>
<td>\centering</td>
<td>12</td>
</tr>
<tr>
<td>\chapter</td>
<td>42</td>
</tr>
<tr>
<td>\circle</td>
<td>18</td>
</tr>
<tr>
<td>\cite</td>
<td>24</td>
</tr>
<tr>
<td>\cleardoublepage</td>
<td>32</td>
</tr>
<tr>
<td>\clearpage</td>
<td>32</td>
</tr>
<tr>
<td>\cline</td>
<td>23</td>
</tr>
<tr>
<td>\closing</td>
<td>30</td>
</tr>
<tr>
<td>\colon</td>
<td>37</td>
</tr>
<tr>
<td>\dashbox</td>
<td>18</td>
</tr>
<tr>
<td>\date</td>
<td>40</td>
</tr>
<tr>
<td>\ddots</td>
<td>37</td>
</tr>
<tr>
<td>\depth</td>
<td>29</td>
</tr>
<tr>
<td>\documentclass</td>
<td>10</td>
</tr>
<tr>
<td>\dotfill</td>
<td>43</td>
</tr>
<tr>
<td>\emph</td>
<td>52</td>
</tr>
<tr>
<td>\encl</td>
<td>30</td>
</tr>
<tr>
<td>\end</td>
<td>12</td>
</tr>
<tr>
<td>\enlargethispage</td>
<td>32</td>
</tr>
<tr>
<td>\fbox</td>
<td>44</td>
</tr>
<tr>
<td>\flushbottom</td>
<td>11</td>
</tr>
<tr>
<td>\fnsymbol</td>
<td>5</td>
</tr>
<tr>
<td>\fontencoding</td>
<td>53</td>
</tr>
<tr>
<td>\fontfamily</td>
<td>53</td>
</tr>
<tr>
<td>\fontseries</td>
<td>53</td>
</tr>
<tr>
<td>\fontshape</td>
<td>54</td>
</tr>
<tr>
<td>\fontsize</td>
<td>54</td>
</tr>
<tr>
<td>\footnote</td>
<td>27</td>
</tr>
<tr>
<td>\footnotemark</td>
<td>27</td>
</tr>
<tr>
<td>\footnotesize</td>
<td>53</td>
</tr>
<tr>
<td>\footnotetext</td>
<td>27</td>
</tr>
<tr>
<td>\frac</td>
<td>37</td>
</tr>
<tr>
<td>\frame</td>
<td>18</td>
</tr>
<tr>
<td>\framebox</td>
<td>18, 44</td>
</tr>
<tr>
<td>\fussy</td>
<td>33</td>
</tr>
<tr>
<td>\height</td>
<td>29</td>
</tr>
<tr>
<td>\hfill</td>
<td>43</td>
</tr>
<tr>
<td>\hline</td>
<td>23</td>
</tr>
<tr>
<td>\hspace</td>
<td>43</td>
</tr>
<tr>
<td>\huge</td>
<td>53</td>
</tr>
<tr>
<td>\Huge</td>
<td>53</td>
</tr>
<tr>
<td>\hyphenation</td>
<td>33</td>
</tr>
<tr>
<td>\include</td>
<td>47</td>
</tr>
<tr>
<td>\includeonly</td>
<td>47</td>
</tr>
<tr>
<td>\indent</td>
<td>35</td>
</tr>
<tr>
<td>Command</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>\input</td>
<td>48</td>
</tr>
<tr>
<td>\item</td>
<td>15</td>
</tr>
<tr>
<td>\itemshape</td>
<td>52</td>
</tr>
<tr>
<td>\kill</td>
<td>21</td>
</tr>
<tr>
<td>\label</td>
<td>7</td>
</tr>
<tr>
<td>\large</td>
<td>53</td>
</tr>
<tr>
<td>\LARGE</td>
<td>53</td>
</tr>
<tr>
<td>\ldots</td>
<td>37</td>
</tr>
<tr>
<td>\lefteqn</td>
<td>14</td>
</tr>
<tr>
<td>\linebreak</td>
<td>18</td>
</tr>
<tr>
<td>\linethickness</td>
<td>18</td>
</tr>
<tr>
<td>\listoffigures</td>
<td>50</td>
</tr>
<tr>
<td>\listoftables</td>
<td>50</td>
</tr>
<tr>
<td>\location</td>
<td>30</td>
</tr>
<tr>
<td>\makebox</td>
<td>44</td>
</tr>
<tr>
<td>\makebox[picture]</td>
<td>19</td>
</tr>
<tr>
<td>\makelabels</td>
<td>30</td>
</tr>
<tr>
<td>\maketitle</td>
<td>40</td>
</tr>
<tr>
<td>\markboth</td>
<td>41</td>
</tr>
<tr>
<td>\markright</td>
<td>41</td>
</tr>
<tr>
<td>\mathbb</td>
<td>52</td>
</tr>
<tr>
<td>\mathcal</td>
<td>53</td>
</tr>
<tr>
<td>\mathfrak</td>
<td>52</td>
</tr>
<tr>
<td>\mathit</td>
<td>52</td>
</tr>
<tr>
<td>\mathnormal</td>
<td>53</td>
</tr>
<tr>
<td>\mathrsfs</td>
<td>52</td>
</tr>
<tr>
<td>\mathsf</td>
<td>52</td>
</tr>
<tr>
<td>\mathbb</td>
<td>52</td>
</tr>
<tr>
<td>\mathbf</td>
<td>52</td>
</tr>
<tr>
<td>\mathversion</td>
<td>53</td>
</tr>
<tr>
<td>\mathchoice</td>
<td>52</td>
</tr>
<tr>
<td>\mdseries</td>
<td>52</td>
</tr>
<tr>
<td>\medskip</td>
<td>43</td>
</tr>
<tr>
<td>\multicolumn</td>
<td>23</td>
</tr>
<tr>
<td>\multinom</td>
<td>19</td>
</tr>
<tr>
<td>\name</td>
<td>30</td>
</tr>
<tr>
<td>\newcommand</td>
<td>8</td>
</tr>
<tr>
<td>\newcounter</td>
<td>6</td>
</tr>
<tr>
<td>\newenvironment</td>
<td>8</td>
</tr>
<tr>
<td>\newfont</td>
<td>9</td>
</tr>
<tr>
<td>\newlength</td>
<td>28</td>
</tr>
<tr>
<td>\newline</td>
<td>33</td>
</tr>
<tr>
<td>\newpage</td>
<td>33</td>
</tr>
<tr>
<td>\newsavebox</td>
<td>45</td>
</tr>
<tr>
<td>\ntheorem</td>
<td>9</td>
</tr>
<tr>
<td>\nocite</td>
<td>25</td>
</tr>
<tr>
<td>\nofiles</td>
<td>50</td>
</tr>
<tr>
<td>\noindent</td>
<td>35</td>
</tr>
<tr>
<td>\nolinebreak</td>
<td>33</td>
</tr>
<tr>
<td>\nopagebreak</td>
<td>33</td>
</tr>
<tr>
<td>\normalsize</td>
<td>53</td>
</tr>
<tr>
<td>\normalfont</td>
<td>52</td>
</tr>
<tr>
<td>\normalshape</td>
<td>53</td>
</tr>
<tr>
<td>\onecolumn</td>
<td>11</td>
</tr>
<tr>
<td>\opening</td>
<td>30</td>
</tr>
<tr>
<td>\oval</td>
<td>19</td>
</tr>
<tr>
<td>\overbrace</td>
<td>37</td>
</tr>
<tr>
<td>\overline</td>
<td>37</td>
</tr>
<tr>
<td>\pagebreak</td>
<td>34</td>
</tr>
<tr>
<td>\pagename</td>
<td>40</td>
</tr>
<tr>
<td>\pageref</td>
<td>7</td>
</tr>
<tr>
<td>\pagestyle</td>
<td>41</td>
</tr>
<tr>
<td>\par</td>
<td>35</td>
</tr>
<tr>
<td>\paragraph</td>
<td>42</td>
</tr>
<tr>
<td>\parbox</td>
<td>45</td>
</tr>
<tr>
<td>\ps</td>
<td>30</td>
</tr>
<tr>
<td>\put</td>
<td>19</td>
</tr>
<tr>
<td>\raggedbottom</td>
<td>11</td>
</tr>
<tr>
<td>\raggedleft</td>
<td>15</td>
</tr>
<tr>
<td>\raggedright</td>
<td>15</td>
</tr>
<tr>
<td>\raisebox</td>
<td>46</td>
</tr>
<tr>
<td>\ref</td>
<td>7</td>
</tr>
<tr>
<td>\refstepcounter</td>
<td>6</td>
</tr>
<tr>
<td>\rmfamily</td>
<td>52</td>
</tr>
<tr>
<td>\roman</td>
<td>6</td>
</tr>
<tr>
<td>\Roman</td>
<td>6</td>
</tr>
<tr>
<td>\rule</td>
<td>46</td>
</tr>
<tr>
<td>\savebox</td>
<td>46</td>
</tr>
<tr>
<td>\sbox</td>
<td>46</td>
</tr>
<tr>
<td>\scriptsize</td>
<td>53</td>
</tr>
<tr>
<td>\selectfont</td>
<td>54</td>
</tr>
<tr>
<td>\sectcounter</td>
<td>6</td>
</tr>
<tr>
<td>\setcounter</td>
<td>6</td>
</tr>
<tr>
<td>\setlength</td>
<td>28</td>
</tr>
<tr>
<td>\settodepth</td>
<td>28</td>
</tr>
<tr>
<td>\settheight</td>
<td>28</td>
</tr>
<tr>
<td>\settowidth</td>
<td>28</td>
</tr>
<tr>
<td>\sloppy</td>
<td>34</td>
</tr>
<tr>
<td>\small</td>
<td>53</td>
</tr>
<tr>
<td>\smallskip</td>
<td>44</td>
</tr>
<tr>
<td>\sqrt</td>
<td>37</td>
</tr>
<tr>
<td>\startbreaks</td>
<td>31</td>
</tr>
<tr>
<td>\stepcounter</td>
<td>6</td>
</tr>
<tr>
<td>\stopbreaks</td>
<td>31</td>
</tr>
<tr>
<td>\subparagraph</td>
<td>42</td>
</tr>
<tr>
<td>\subsection</td>
<td>42</td>
</tr>
</tbody>
</table>
\textbf{Command Index}

A
array ........................................... 12

C
center ......................................... 12

D
description ................................. 13

equation ...................................... 14

equation ...................................... 14

F
figure .......................................... 14

I
itemize ........................................ 15

L
letter ........................................... 16

M
minipage ...................................... 16

P
picture ......................................... 17

Q
quotation .................................... 20

R
tabbing ....................................... 20

table .......................................... 22

tabular ........................................ 22

T
thebibliography ........................... 24

V
verbatim ..................................... 26

verb ............................................. 26

verse ......................................... 26
# Table of Contents

1 Overview of LaTeX and Local Guide ........ 3

2 Commands ........................................ 5

2.1 Counters ........................................ 5
   2.1.1 \addtocounter .................................. 5
   2.1.2 \alph ........................................ 5
   2.1.3 \arabic ....................................... 5
   2.1.4 \fnsymbol ..................................... 5
   2.1.5 \newcounter ................................. 6
   2.1.6 \refstepcounter ............................. 6
   2.1.7 \roman ....................................... 6
   2.1.8 \stepcounter .................................. 6
   2.1.9 \setcounter ................................... 6
   2.1.10 \usecounter .................................. 6
   2.1.11 \value ...................................... 6

2.2 Cross References .................................. 7
   2.2.1 \label ........................................ 7
   2.2.2 \pageref ...................................... 7
   2.2.3 \ref .......................................... 7

2.3 Definitions ....................................... 8
   2.3.1 \newcommand ................................. 8
   2.3.2 \newenvironment ............................. 8
   2.3.3 \newtheorem .................................. 9
   2.3.4 \newfont ..................................... 9

2.4 Document Classes .................................. 10

2.5 Layout ............................................ 11
   2.5.1 \flushbottom .................................. 11
   2.5.2 \onecolumn .................................... 11
   2.5.3 \raggedbottom ................................ 11
   2.5.4 \twocolumn ................................... 11

2.6 Environments ..................................... 12
   2.6.1 array ......................................... 12
   2.6.2 center ........................................ 12
      2.6.2.1 \centering ................................. 12
   2.6.3 description .................................. 13
   2.6.4 enumerate .................................... 13
   2.6.5 eqnarray ...................................... 13
   2.6.6 equation ...................................... 14
   2.6.7 figure ........................................ 14
   2.6.8 flushleft ..................................... 14
      2.6.8.1 \raggedright ............................. 15
   2.6.9 flushright .................................... 15
<table>
<thead>
<tr>
<th>Section</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6.9.1</td>
<td>\raggedleft</td>
</tr>
<tr>
<td>2.6.10</td>
<td>itemize</td>
</tr>
<tr>
<td>2.6.11</td>
<td>letter</td>
</tr>
<tr>
<td>2.6.12</td>
<td>list</td>
</tr>
<tr>
<td>2.6.13</td>
<td>minipage</td>
</tr>
<tr>
<td>2.6.14</td>
<td>picture</td>
</tr>
<tr>
<td>2.6.15</td>
<td>quotation</td>
</tr>
<tr>
<td>2.6.16</td>
<td>quote</td>
</tr>
<tr>
<td>2.6.17</td>
<td>tabbing</td>
</tr>
<tr>
<td>2.6.18</td>
<td>table</td>
</tr>
<tr>
<td>2.6.19</td>
<td>tabular</td>
</tr>
<tr>
<td>2.6.20</td>
<td>thebibliography</td>
</tr>
<tr>
<td>2.6.21</td>
<td>theorem</td>
</tr>
<tr>
<td>2.6.22</td>
<td>titlepage</td>
</tr>
<tr>
<td>2.6.23</td>
<td>verbatim</td>
</tr>
<tr>
<td>2.6.24</td>
<td>verse</td>
</tr>
<tr>
<td>2.7</td>
<td>Footnotes</td>
</tr>
<tr>
<td>2.7.1</td>
<td>\footnote</td>
</tr>
<tr>
<td>2.7.2</td>
<td>\footnotemark</td>
</tr>
<tr>
<td>2.7.3</td>
<td>\footnotetext</td>
</tr>
<tr>
<td>2.8</td>
<td>Lengths</td>
</tr>
<tr>
<td>2.8.1</td>
<td>\newlength</td>
</tr>
<tr>
<td>2.8.2</td>
<td>\setlength</td>
</tr>
<tr>
<td>2.8.3</td>
<td>\addtolength</td>
</tr>
<tr>
<td>2.8.4</td>
<td>\settowidth</td>
</tr>
<tr>
<td>2.8.5</td>
<td>\settodepth</td>
</tr>
<tr>
<td>2.8.6</td>
<td>\settodepth</td>
</tr>
</tbody>
</table>

15, 15, 16, 16, 16, 17, 18, 18, 18, 18, 19, 19, 19, 19, 20, 20, 20, 22, 22, 22, 23, 23, 24, 24, 24, 25, 25, 26, 26, 27, 27, 27, 28, 28, 28, 28, 28, 28, 28, 28, 28.
2.15.7 \pagestyle ................................................. 41
2.15.8 \markboth ................................................. 41
2.15.9 \markright .................................................. 41
2.15.10 \thispagestyle ........................................... 41

2.16 Sectioning .................................................... 42

2.17 Spaces & Boxes ............................................. 43

| 2.17.1 \dotfill | 43 |
| 2.17.2 \hfill | 43 |
| 2.17.3 \hrulefill | 43 |
| 2.17.4 \hspace | 43 |
| 2.17.5 \addvspace | 43 |
| 2.17.6 \bigskip | 43 |
| 2.17.7 \medskip | 44 |
| 2.17.8 \smallskip | 44 |
| 2.17.9 \vfill | 44 |
| 2.17.10 \vspace | 44 |
| 2.17.11 \fbox | 44 |
| 2.17.12 \framebox | 44 |
| 2.17.13 \lbox | 44 |
| 2.17.14 \makebox | 44 |
| 2.17.15 \mbox | 45 |
| 2.17.16 \newsavebox | 45 |
| 2.17.17 \parbox | 45 |
| 2.17.18 \raisebox | 46 |
| 2.17.19 \rule | 46 |
| 2.17.20 \savebox | 46 |
| 2.17.21 \sbox | 46 |
| 2.17.22 \usebox | 46 |

2.18 Special Characters .......................................... 47

2.19 Splitting the Input ......................................... 47

| 2.19.1 \include | 47 |
| 2.19.2 \includeonly | 47 |
| 2.19.3 \input | 48 |

2.20 Starting & Ending ........................................... 49

2.21 Table of Contents .......................................... 50

| 2.21.1 \addcontentsline | 50 |
| 2.21.2 \addtocontents | 50 |

2.22 Terminal Input/Output ...................................... 51

| 2.22.1 \typein | 51 |
| 2.22.2 \typeout | 51 |

2.23 Typefaces .................................................. 52

| 2.23.1 \styles | 52 |
| 2.23.2 \sizes | 53 |
| 2.23.3 \lowlevelfontcommands | 53 |

3 Parameters .................................................. 55
Concept Index ................................. 57
Command Index ................................. 61