Reference Sheet for a LATEXDocument

→ Modified Version of https://tug.ctan.org/info/latex-refsheet/

A. LATEX Basics

A.1. Units and Lengths

→ (Some) units for length and dimensions:

bp point (typographic) mm millimeter px pixel cm centimeter

→ Document dependent units:

Z\textwidth, Z\linewidth, Z\columnwidth, Z\textheight with z a percentage value, e.g. 0.50\textwidth

→ Amounts like \smallskipamount, \medskipamount, \bigskipamount.

A.2. Reserved Characters (see also F.1. cf. H)

\	introduces a command	\textbackslas
{ }	embraces arguments, creates logical parts	\{ \}
[]	embraces optional arguments	[]
%	comments: code after % will be ignored.	\%
&	separates columns in tabular-like environments	\&
#	parameter for own command declarations	\#
\$	text style math mode (abbr. for \(\))	\\$
_^	index/exponent only valid in math mode, e.g. a_1^2	see F.1

B. Preamble (before \begin{document})

B.1. Documentclass (necessary)

Use: \documentclass[opt,opt,...]{class}

Recommended classes: scrartcl, scrreprt, scrbook, scrlttr2

Non-KOMA-Script classes: beamer, article, IEEEtran

Common options with default Values available (subtotal) fontsize=11nt

10pt | 12pt (e.g. 12.5pt also valid) paper=a4, paper=portrait a3 | a5 | b4 | letter, landscape

parskip=no half | full

small | normal headings=big captions=tablebelow,figurebelow tableabove, figureabove

twocolumn=false true

usegeometrv=false

→ Options of document class are passed to every loaded package.

→ Set or change options later in file, e.g. \KOMAoptions{twoside=true}

B.2. Loading Packages

\usepackage[options]{package}

\PassOptionsToPackage[options]{package}

B.3. Encoding Settings

\usepackage[utf8]{inputenc} % most IDEs use UTF8 \usepackage[T1]{fontenc} % most fonts needs T1

B.4. Language Settings with babel

Load: \usepackage[ngerman, main=english]{babel}

Use: \selectlanguage{\language} \foreignlanguage{\language}{\text}

\documentclass[italian]{scrbook} % global option \usepackage[british.main=italian]{babel} % package option \usepackage{csquotes} % package csquotes knows italian

C. Lavout

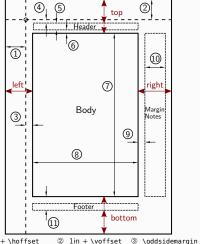
C.1. Changing Page Layout with geometry

→ Set option usegeometry=true.

\usepackage[left=2cm,right=2,top=3cm,bottom=4cm]{geometry}

- → Auto-completion determines unspecified dimensions (under or over specified as well), here width and height of text (see C.2).
- → Other options: paper=a4paper, landscape|portrait, includehead, includefoot, includeheadfoot, twocolumn bindingoffset=Xcm
- → Changing page layout mid document: \newgeometry{ opt, opt, ... }

C.2. Page Layout



- ① lin + \hoffset
- 4 \topmargin ⑦ \textheight
- ⑤ \headheight ⑥ \headsep \textwidth
- (0) \marginparwidth (1) \footskip

Hint: This image with the current values of the specific document can be generated by loading the package layout and the command \layout.

C.3. Linespread with setspace

Load: \usepackage[onehalfspacing]{setspace} for 1.5 line spacing. Other Options: singlespacing, doublespacing

D. Document Structure

D.1. Start Document

\begin{document} Complete document contents. \end{document}

simple title: $\arrange title {text} \arrange title {text} \arrange title {text} \arrange title {text} {today} {today} {total total total$

D.3. Table of Contents, List of Figures (for other List of see ?? & K) \tableofcontents \listoftables \listoffigures

D.4. Headings

\paragraph{ title}

\part{ title} \chapter{ title} \section{ title}

\subsection{ title} \subsubsection{ title} \subparagraph{ title}

- → \chapter only valid in documentclass scrbook and scrreprt
- → Use the optional parameter for short titles in headings and table of contents, e.g. \section[short title]{title}
- → Use * variants for headings without numbering, no change in counter and no entry in table of contents
- → Use \addpart, \addchap or \addsec for unnumbered headings, but with running heading and entry in table of contents.

The * variants delete the running heading.

D.5. Justification

Environment	Declaration	Other
\begin{center} \begin{flushleft} \begin{flushright}	\centering \raggedright \raggedleft	<pre>text \par\vfill text text \hfill text \raggedbottom, \flushbottom</pre>

D.6. Lists

\begin{itemize}[options] with bullets \item or \item[svmbol]

\begin{enumerate}[options] with numbers \item

\begin{description}[options] with bold words \item[word]

→ Lists can be nested

\begin{itemize} \item First item

\item[!] Second item, with a ! instead of a bullet \end{itemize}

D.7. Enhanced Lists with enumitem

Load: \usepackage{enumitem}

Define settings for a new list:

Possible Options (enumerate):

- → label=\roman.)* (use extra symbols like '.)' etc before the *) \Alph*, \alph*, \Roman*, \roman*, \arabic*
- ⇒ start=0* set the start of the counter
- → resume continue counter from previous list
- → noitemsep,nolistsep removes the spacing

\newlist{mylist}{enumerate}{10}

\setlist[mylist]{label*=\arabic*.,noitemsep}

Use: \begin{mylist} \item ...\end{mylist}

E. Typographic Issues and overfull hboxes

E.1. Spacing horizontally

Avoid spacing with fixed units like \hspace{0.5cm} use \quad or \qquad instead (see also A.1). Spacing in math is almost always right!

Math		Math/Text		Math/Text			Math/Text		
a b	ab	a∖!b <i>ab</i>	ab	a∖;b	a b	a b	a b	а	b
a\>b	a b	a∖,b <i>a b</i>	a b	a∖ b	a b	a b	a\qquad b	а	Ŀ

\hspace{/ength}: * variant \hspace*{/ength} space even at line start Use with care: \hphantom{text}

\indent produces an indent. \noindent skips the automatic new paragraph indent.

E.2. Spacing vertically

- → Vertical space is only effective between paragraphs
- → Avoid spacing with fixed units like \vspace{0.5cm} use rubber length like \smallskip, \medskip or \bigskip instead (see also A.1)
- → \vspace{length}; * variant \vspace*{length} space even at page start
- → \par or an empty line starts a new paragraph
- → \\ new line. Use sparingly, mostly in tabulars.
- → \\[unit] (see A.1)
- → new page: \pagebreak A \indent produces an indent.
- → Use with care: \vphantom{text}

E.3. Preventing Breaks

- → Protected space between words: ~
- → Prevent line breaking within text: \mbox{text}
- → Prevent page breaks: \nopagebreak[num], num between 1 and 4
- → Cheat a bit on page size: \enlargethispage{unit} (see A.1)

F. Text

F.1. Text Symbols/Characters (see also A.2)

A lot of diacritic symbols can be typed directly, e.g. è é ê ñ ç

_ \textunderscore{} ~ \textasciitilde{} ^ \textasciicircum{} ... \ldots \textbar Other symbols need packages, e.g. € \texteuro (textcomp)

Command	Declaration	Effect
\textrm{text}	{\rmfamily text}	Roman family
\textsf{ text}	{\sffamily text}	Sans serif family
\texttt{ text}	{\ttfamily text}	Typewriter family
\textmd{ text}	{\mdseries \text}	Medium series
\textbf{ text}	{\bfseries text}	Bold series
\textup{ text}	{\upshape text}	Upright shape
\textit{text}	{\itshape text}	Italic shape
\textsl{ <i>text</i> }	{\slshape text}	Slanted shape
\textsc{ text}	{\scshape text}	SMALL CAPS SHAPE
More general comm	ands:	
\emph{ text}	{\em text}	Emphasized
\textnormal{text}	{\normalfont text}	Document font

F.3. Font Size

\large

Font size is relative to the base font size, specified in the document class.

\Large Large \tiny \scriptsize scriptsize \LARGE LARGE \footnotesize footnotesize \huge huge \small small \normalsize normalsize \Huge Huge

Use: {\small text} or {\huge text\par} to limit the size change.

F.4. Colors with xcolor

\usepackage{xcolor}

large

\definecolor{DarkBlue}{RGB}{0, 115, 207} % custom color

\colorlet{greenblue}{green!10!blue} % new custom color with 10% green and 90% blue \textcolor{red}{text in red} or {\color{red}text} \colorbox{gray!25}{text} % text in gray (faded by 25%) box

Predefined colors:

white gray black red green blue cyan magenta yellow

Fade a color with color! value between 0 and 100

Headings in color: \setkomafont{disposition}{\color{color}}

F.5. Footnotes

Print footnote marker in text and footnote at \footnote{text}

bottom of page

\footnotemark Print footnote marker in text (e.g. within tabular or caption)

Print footnote at bottom of page \footnotetext{text}

F.6. References with hyperref (loads url implicitly)

\autocite{citekey} Cite a bibliographic reference (package biblatex) \label{marker} Set a marker for cross reference, often if the form

\label{sec:item} or \label{fig:diag1} \autoref{marker} Give type name and number of marker

\autopageref{marker} Give abbreviation of "page" and page number of marker

Print clickable web page \url{url}

\href[options]{url}{text} Print clickable link Print clickable reference \hyperref[marker]{text}

G. Figures & Tables (floating environments)

G.1. Figures with graphicx

Load: \usepackage{graphicx}

Use: \includegraphics[opt]{file} (png, jpg, pdf)

 $Use: \begin{figure} ... \caption{..} \label{fig:x} \end{figure}$

\graphicspath{{src/}{img/}} %subfolder images; set in preambel \begin{figure}\centering \includegraphics[width=.8\columnwidth]{pic.jpg}

\caption[Short title]{Long title}\label{fig:ff} \end{figure}



\begin{table}[htbp] \centering
\caption(Table caption)\label(tab:exp}
\begin{tabular}{@{}ll@{}}
\emph{Name} & \emph{Desc.}\\ \hline
entry & entry
\end{tabular}
\end{tabular}

- → surpress leading space {@{}ll@{}}
- → fixed width cells { | m{5em} | m{1cm} | m{1cm} | }
- → fixed width table
- \begin{tabularx}{0.8\textwidth}{c|c}\end{tabularx}
- → alignment of cols

in{tabularx}{	
>{\raggedright\arraybackslash}X	
>{\centering\arraybackslash}X	
>{\raggedleft\arraybackslash}X }	
	>{\raggedright\arraybackslash}X

- → multirow \usepackage{multirow}
- → multipage \usepackage{longtable}

Column separation: @{\hspace{unit}} or \setlength{\tabcolsep}{unit} Row separation: \\[unit] or \renewcommand{\arraystretch}{unit} Partial lines: \cline{2-3} instead of \hline

row coloring {\rowcolors{3}{green!80!yellow!50}{green!70!yellow!40}} (set outside table) Additional packages: array, booktabs, tabu, xcolor with option table, tabulary, tabulary

G.3. Code Listings with verbatim Built-In Option (no hightlighting)

Use: Environment: \begin{verb} ... \end{verb}
In line: \verb|...| (same start- and end char)

G.4. Fancy Code Listings with listings

Load: \usepackage{listings}

Options: Various Styling of Code possible. Keywords, Comments etc are recogized and can be set as a style

Use: \lstdefinestyle{mystyle}{language=Python, Options}

\lstset{style=mystyle}

Environment: \begin{lstlisting} ... \end{lstlisting}

In line: \lstinline+ ... \lstinline+: (same start- and end char)
File: \lstinputlisting{filename}

1	# Python selection
2	secret=42
3	<pre>guess=int(input("Enter number: "))</pre>
4	if quess==secret:
5	print ("You won!")
6	elif guess <secret:< th=""></secret:<>
7	print ("No, secret number is bigger.")
8	else:
9	<pre>print ("No, secret number is smaller.")</pre>

G.5. Boxes and Rules

Normal: \parbox[pos][height][contentpos]{width}{text} or \begin{minipage}[pos][height][contentpos]{width}text\end{minipage} \Lift Text: \raisebox{\lift}[height][depth]{text}

Framed Box: \fbox{text} or \framebox[width][pos]{text}

Colored Box (xcolor): \colorbox{backgroundcolor}{text}
Framed colored Box: \fcolorbox{bordercolor}{backgroundcolor}{text}

Resize (graphicx): \scalebox{10}{Giant}

Lengths: \setlength{\fboxsep}{unit}, \setlength{\fboxrule}{unit}

H. Math

H.1. Math mode (Standard LATEX)

H.I. Math mode (Standard $E^{(x^2)}$) Textstyle: $((x^2 + 4)) x^2 + 4 x^2 + 4$ as part of the text. Displaystyle: $[x^2 + 4] \rightarrow \text{separat line, centered}$ Equation: $\text{degister} \{name\}$

$$\lambda := \lim_{x_1 \to \infty} \int_{x_0}^{x_1} \frac{f\left(\frac{t}{2}\right)}{\sqrt[n]{t^2 + \sin^2(t)}} dt \stackrel{!}{\leq} 1 \tag{1}$$

- → Use * variant for unnumbered equation (without label).
- → Options for positions of equation number: legno or regno.

```
H.2. Important Symbols in Math
                          +
                             \pm
                                        ≤ \le
                          < \11
                                           \cdot
               \ge
                          >>
                              \gg
                                           \times
               \ne
                             \equiv
                                            \approx
           - 1
               \perp
                              \mid
                                            \parallel
           \nabla
                              \Delta
               \nabla
                                            \partial
∈ \in
               \forall
                          3
                              \exists
                                            \nexists
\cap
               \cup
                              \notin
                                            \setminus
   \ell
               \angle
                              \circ
                                            \emptyset
   \lor
           ∧ \land
                              \lnot
                                        Ø \varnothing
⊤ \top
           ⊥ \bot
```

H.3. Math Functions (upright typeface)

à

\ddot{a}

\hat{a}

â

```
H.5. Fonts and Sizes in Math Mode (some from amsmath)
```

\dot{a}

	aA		aA
	aA		aA
	aA		1 + aA
	$\mathbb{A}\mathbb{Z}$		AZ
	213		α
\displaystyle	\scriptstyle	\scriptscriptstyle	\textstyle

```
H.6. Often used Math Expressions
```

a

above

mid

\vec{a}

x^{n+1}	x^{n+1}	E_{kin}	$E_{\text{-}}{\mathbf{kin}}$
$\frac{a+b}{2}$	\frac{a+b}{2}	$\sqrt[n]{a^2 + b^2}$	\sqrt[n]{a^2+b^2}
x_1, \ldots, x_n	x_1 , \ldots, x_n	$x_1 + \cdots + x_n$	$x_1 + \cdot cdots + x_n$

1	x_1,\ldots,x_n x_{-1}	, \ldots, xn $x_1+\cdots+x_n$ $x1+ \cdot cdots + xn$
	(2)	\left(a + \frac{1}{2} \right)^2
	$\sum_{i=1}^{N} \prod_{i=1}^{N}$	lem:lem:lem:lem:lem:lem:lem:lem:lem:lem:
	$\lim_{a\to\infty}$	\lim_{a \rightarrow \infty}
	\int_{Ω}	$\int_a^b x^2\$ \mathrm{d}x
	$\begin{vmatrix} \frac{\mathrm{d}f}{\mathrm{d}x} \Big _{x_0} \\ A^{\dagger} A^* \end{vmatrix}$	$\label{lem:left. frac{\mathbb{d}f}{\mathbb{d}x} \left -\{x_0\} \right } $$ \ x_0 \ _{L^2(x_0)} .$
	$A^{\dagger} A^*$	$A^{\dagger} \ \ \ \ \ \ \ \ \ \ \ \ \$
	2x - 6y	lem:lem:lem:lem:lem:lem:lem:lem:lem:lem:
	= 0, since $x = 3y$	

\stackrel{!}{<} \stackrel{\mathrm{def}}{=}

mid \overset{above}{mid} \underset{below}{mid}

H.7. Math with amsmath (replacing standard Environments)

equation	equation*	One line, one equation
multline	multline*	One unaligned multiple-line equation, one number
gather	gather*	Several equations without alignment
align	align∗	Several equations with multiple alignments
alignat	alignat∗	Multiple alignments, choose spacing between cols
flalign	flalign∗	Several equations: horizontally spread form of align
cases		Alignment for cases
split		A simple alignment within a multiple-line equation
aligned		A "mini-page" with multiple alignments

- → The content is automatically placed in math mode.
- → Use \intertext{text} to set text within an amsmath environment

A "mini-page" with unaligned equations

- → Length parameter to influence vertical spacing within any amsmath environment: \jot (e.g. \addtolength{\jot}{1ex})
- → Add singular vertical space for a line via \\[<amount>] (see A.1)

H.7.1. amsmath align

Aligns at &.

gathered

/ mgns at a.		
\begin{align}		
y &= d\\	y = d	(1)
<pre>y &= cx+d \nonumber\\ y &= bx^{2}+cx+d \label{eq:key}</pre>	y = cx + d	
\end{align}	$y = bx^2 + cx + d$	(2)

H.7.2. amsmath matrix

\begin{pmatrix} a & b \\ c & d \end{pmatrix}

matrix	pma	trix	bma	trix	Bma	atrix	vma	trix	Vma	trix
	/	. \	г	. 1	(.)	1	. 1	П	. 1

H 7.3 Dots

\dots or \ldots ... \cdots ...

\vdots \ddots \ddots \hdotsfor[cols]{dotspace} multicolumn dots

H.8. amsmath cases

\end{cases}

 $f(n) = \left\{ \begin{array}{ll} f(n) & \left(\sin \left(\frac{1}{n} \right) & \left(\frac{1}{n} \right) \\ -(n+1)/2 & \left(\frac{1}{n} \right) & \left(\frac{1}{n} \right) \\ \end{array} \right.$

$$f(n) = \begin{cases} n/2 & \text{if } n \text{ is even} \\ -(n+1)/2 & \text{if } n \text{ is odd} \end{cases}$$

H.9. Arrows

→ \mansto √ \leadsto → \rightarrow \Rightarrow → \longrightarrow ⇒ \Longrightarrow ← \leftarrow ← \Leftarrow ← \longleftarrow ← \Longleftarrow \uparrow \Uparrow \downarrow \Downarrow ↔ \leftrightarrow ⇔ \Leftrightarrow ightharpoonup \rightrightarrows

H.10. Delimiters

- (.) (.) [.] [.] \\[lfloor.\rfloor \\rfloor \\\rfloor \\rfloor \rfloor \\rfloor \\rfl
- → Use \left expr \right to stretch delimiters to the height of expr
- → A missing delimiter can be added with ., e.g. \left.
- → For manual sizing use \big, \Big, \bigg, e.g. \Big\| \Big\lceil

I. TikZ Nodes

```
\begin{tikzpicture} [node distance={25mm}, thick, main/.style = {draw, circle}] \node[main] (0) {0}; \node[main] (1) [above left of=0] {1}; \draw (0) -- node[midway, below, sloped] {abc} (1); \draw (4) to [out=260,in=340, looseness=5] \node[midway, below, sloped] {0} (4); \draw[->] (0) -- (1 \draw[->] (1,-1) -- (f);); \end{tikzpicture}
```

J. Own Commands and Environments

J.1. Own Commands in General

- → \newcommand doesn't work if the command is already defined: so it's a completely new definition.
- → \renewcommand works only if the command is already defined: it's a redefinition.
- → \providecommand works like \newcommand, but if the command is already defined, the (re)definition is ignored.

J.2. Own Commands

Params: #1 . . . #9

\setlisted{1,2,3,4} will produce $\Omega = \{1,2,3,4\}$

np: \newcommand{\mytext}{Some text which I need very often.}

K. Bibliography with biblatex & External Processor biber

K.1. Entry types
@article @book @inbook @collection
@incollection @manual @misc @online
@patent @phdthesis @proceedings @periodical @report
@techreport @thesis

K.2. Entry Fields

author title journal year volume editor publisher institution school series pages organization number note key

K.3. Styles

alphabetic authoryear authortitle numeric mla verbose chem-acs phys nature science ieee apa See https://de.sharelatex.com/learn/Biblatex bibliography styles

K.4. Example

% in preambel
\usepackage[autostyle=true]{csquotes} % Load
\usepackage[backend=biber,style=nature,language=british]
 {biblatex} % Load
\uaddbibresource(mybibliographyfile.bib} % Define
% anywhere within the document
\uautocite{citekey} % Use
\printbibliography % Print

```
# example.bib
emisc{ WC:2017, % cite reference name (\autocite{WC:2017})
  author = {Wikipedia},
  title = {\TeX{}---Wikipedia{,} The Free Encyclopedia},
  note = {\url{https://en.wikipedia.org/wiki/TeX},
  last referenced 24-June-2017}
}
```