LaTeX Quick Reference

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1 Introduction

This document offers some guidance to novice LaTeX users. It is a list of frequently used LaTeX commands and packages. With just the information in this document it is possible to create a manuscript that contains most commonly used typographic entities like bullets, enumerations, graphics, tables and math. Of course not all LaTeX features are included in this list. But because LaTeX has a very active online community, anything related to LaTeX can be easily found by performing an online search.

2 Commonly used LaTeX commands

Table 1: Document skeleton

LaTeX command	Description
`\documentclass[<fontsize>,<paper>]{<type>}`	The start of every latex file. Sets the document class file to use.
`\usepackage{}`	Loads a package.
`\title{<title>}`	Sets the document title.
`\author{<name>}`	Sets the author name or names.
`\maketitle`	Creates the title (article) or title page (report,book)
`\tableofcontents`	Inserts a table of contents
`\input{file}`	Inserts the contents of `file`.
`\include{file}`	Inserts the contents of `file` preceded and followed by a `\clearpage`
`\bibliographystyle{stylefile}`	Defines which .bst style file to use for the bibliography (use `unsrt` if you don't care).
`\bibliography{bibfile}`	Defines which .bib file to use and renders the bibliography section.

Table 2: Typeface changing commands

LaTeX command	Description
`{\bf ..}`	bold font
`{\it ..}`	italic font
`{\ul ..}`	underlined font
`\emph {..}`	emphasized font (usually italic, but may depend on document class)
`$^\textnormal{..}$`	Superscript
`$_\textnormal{..}$`	Subscript
`{\small ..},{\normalsize ..},{\large ..} etc`	font size

Table 3: Layout commands.

LaTeX command	Description
`\newpage`	Pagebreak
`\vspace{..}`	Vertical space
`\hspace{..}`	Horizontal space
`\\`	New line
`<blank line>`	Paragraph break

Table 4: Document structure

LaTeX command	Hierarchy level
`\part{..}`	-1
`\chapter{..}`	0 (only books and reports)
`\section{..}`	1
`\subsection{..}`	2
`\subsubsection{..}`	3
`\paragraph{..}`	4
`\subparagraph{..}`	5

Table 5: References and citations

LaTeX command	Description
`\label{..}`	Inserts a label. Examples: `\label{fig:myFig}`, `\label{sec:theory}`, `\label {eq:gauss}`.
`\ref{..}`	Inserts a reference to a label.
`\eqref{..}`	Inserts a reference to an equation (package `amsmath`). Example: `\eqref{eq:gauss}`.
`\cite{..}`	Inserts a citation to a bibliographic item.
`\pageref{}`	Inserts a reference to the page number of a label.
`\footnote{..}`	Creates a superscript footnote symbol and puts the footnote text at the bottom of the page.

2.1 Dimensions

Any time a command requires you to provide a length parameter (such as `width`, `height`, `size`, etc.) you can enter a number with any of the following units: pt, cm, mm, in, px, ex, em and some more exotic ones. It is also possible to enter a fraction of a certain layout dimension such as: `0.5\textwidth` or `0.7\columnwidth`, which sets the dimension to half the text width or 0.7 times the column width (in case of multiple columns).

3 List structures

3.1 Enumeration

LaTeX command:

```
\begin{enumerate}
\item The first item
\item The second item
\item The last item
\end{enumerate}
```

Result:

1. The first item
2. The second item
3. The last item

3.2 Itemization (bullet list)

LaTeX command:

```
\begin{itemize}
\item First
\item Second
\item Third with subitems
    \begin{itemize}
    \item subitem
    \item subitem
    \end{itemize}
\end{itemize}
```

Result:

- First
- Second
- Third with subitems
  - subitem
  - subitem

4 Floating environments

A floating environment is a document element of which the exact location cannot be directly controlled by the user, but is automatically determined by LaTeX. Most floating environments have a 'caption': a block of text which is printed above or below the content.

All floating environments can be given an optional argument that specifies where LaTeX should *attempt* to place it. The options are `h` (here), `t` (top of the page), `b` (bottom of the page) and `p` (separate page). Multiple arguments can be given to specify in which order LaTeXshould attempt to place the floating environment. For example: `[htbp]` means: try to place it here, if that fails place it on top of the page, on the bottom of the page, or, if that also fails, place it on it's own page. An exclamation mark behind one of the characters forces LaTeX to try harder. The default float location argument is `[tbp]`.

4.1 Figure

When rendered to PDF, LaTeX supports the following image file formats: png, pdf, jpg.

```
\begin{figure}[htbp]
\includegraphics{pics/something_interesting.pdf}
\caption{This figure shows something interesting.}
\label{fig:somethingInteresting}
\end{figure}
```

4.2 Table

LaTeX command:

```
\begin{table}[htbp]
\centering \caption{This is a table}
\begin{tabular}{rcl}
\toprule
A             & B     & C\\
\midrule
lorem         & ipsum & dolor \\
sit           & amet  & consectetur \\
adipisicing   & elit  & balls \\
\bottomrule
\end{tabular}
\end{table}
```

Result:

Table 6: This is a table

A	B	C
lorem	ipsum	dolor
sit	amet	consectetur
adipisicing	elit	balls

5 Math

LaTeX is particularly good at typesetting mathematics. This section gives a brief overview of the possibilities. For a complete list of commands see: http://en.wikibooks.org/wiki/LaTeX/Mathematics.

5.1 Inline math

To type math expressions inside a normal paragraph, surround the math expression with dollar signs. Example: this sentence contains an inline formula that depends on x and y. Here it is: $y = \int_0^x 2x' \mathrm{d}x' + 3$.

5.2 Equation environment

To place an equation on a separate line and let LaTeX assign a reference number to it, use the equation environment:

```
\begin{equation}
\label{eq:NewtonsFirstLaw}
F = m \cdot a
\end{equation}
```

$$F = m \cdot a \tag{1}$$

6 Essential packages

- `\usepackage[english]{babel}`: Ensures proper hyphenation in the English language.
- `\usepackage[utf8]{inputenc}`: Állöws typïng ôf ùníçøde chåråçtérs.
- `\usepackage[T1]{fontenc}`: extends the default OT1 7-bit font encoding of TeX to the T1 8-bit font encoding
- `\usepackage[small,bf,hang]{caption}`: Nicer captions for figures and tables.
- `\usepackage{xcolor}`: allows you to color text, like: `{\color{red}{..}` which will look like this.
- `\usepackage{fourier}`: sets the font to Utopia which is nice and modern looking. Also provides lots of additional mathematics symbols.
- `\usepackage{booktabs}`: allows you to use the commands `\toprule`, `\midrule` and `\bottomrule` in tables which is nice.
- `\usepackage{graphicx}`: without this package it is impossible to include figures!
- `\usepackage{amsmath}`: extended mathematics functionality
- `\usepackage{siunitx}`: typesetting numbers and units, see section 6.1.
- `\usepackage{hyperref}`: makes all citations, references and URLs clickable in the output pdf.
- `\usepackage{cleveref}`: a cleverer way to do cross-referencing than the standard way. Import this package after all the others.

6.1 SIunitx

The `siunitx` package introduces a set of absolutely essential commands for typesetting numbers with units. Never again look for the 'mu' symbol, but simply type `\SI{10}{\micro\metre}`, to get 10 µm. Note that the space between the number and the unit is slightly smaller than the space between two words, which is exactly the way it is supposed to be and which is really tedious to accomplish with a program like MS Word.

Also the readability of large numbers like '1000000' can be improved by writing `\num{1000000}`, which results in 1 000 000. Delimiters (thin spaces in this case) divide the number in groups consisting of no more than three digits.

Finally, `siunitx` supports automatic alignment of the numbers within table columns. This enables for example centering on the decimal marks. All you need to do is change the column argument of the tabular command. Example: `\begin{tabular}{S S[table-parse-only]}`. This example will result in a table with two columns. The left column will be decimal-centered while the right column will be centered in the regular way.

Table 7: A table with aligned numbers

Decimal-centered	Regular centering
1234.5	1234.5
-88.8 ± 0.9	-88.8 ± 0.9
4.5×10^5	4.5×10^5

7 Optional packages

The packages listed here are not required to create a document, but provide functionality you might desire occasionally.

- `\usepackage{fullpage}`: Uses the entire page for the document.
- `\usepackage{geometry}`: Allows you to manually specify the dimensions of margins, headers, footers, etc.
- `\usepackage{todonotes}`: Allows you to add little todo notes in the document and its margins, insert missing figure placeholders and print a list of all todos.
- `\usepackage{natbib}`: Extended literature citation functionality.
- `\usepackage{glossaries}`: To create glossaries, nomenclatures and alike.

A LaTeX typesetting style guide

Proper use of LaTeX

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Abstract. How to properly write scientific text using LaTeX. Many people make many typographical mistakes, even journals make them. And because I am quite pedantic about this, here is a list of how it should be done. Unfortunately for you, it is not up for debate, it is just the way it is written below. *Authors of scientific literature are likely to have no clue about all this! Editors of scientific literature are (arguably a little less) likely to have no clue either!* Typesetters of scientific literature know something, but they too make mistakes; see *e.g.* J. Micromech. Microeng., with an italic 'mu' in micrometer.

Following the rules here, I think you'll find it much easier to read math. Mathematical typography requires attention to detail. You should understand the difference in meaning between $\mu_p = \left(\frac{T}{100}\right)^p$ and $\mu_\mathrm{p} = \left(\frac{T}{100}\right)^p$. Perhaps then you'll appreciate the beauty of written mathematical language.

Have fun!

For a less agitated (and better, but longer) text on scientific typesetting, see [Beccari(1997)].

1. Packages

Have a look at the preamble of this document. Useful packages are: `siunitx` for writing units, `booktabs` for making nice tables, `amsmath` mostly for the `\text` command.
For IOP journals, use the modified LaTeX package used by this package, in order to use `siunitx` and `amsmath`.

2. Units

Units should be **upright**, not italic. Why? Because in most contexts, $10cm^2$ means ten times the speed of light times variable m squared. Ten centimeter squared should be typeset as $10\,\mathrm{cm}^2$, written in LaTeX as `10~cm$^2$`, or (better) using the `siunitx` package: `\SI{10}{cm^2}`. Note the thin space between number and unit. The package documentation of `siunitx` is well worth reading.
Micrometer is abbreviated by µm, note that the 'mu' is upright! μm is wrong and means something like permeability times meter? Compare with an acceleration of $10g\ \mathrm{N\,m^{-2}}$, where g is the standard gravity; and $10\ \mathrm{g\,N\,m^{-2}}$, meaning 10 grams Newton per meter squared. An interesting unit is the 'kilo Watt hour' unit kWh: $11\,\mathrm{kWh}$ and $11\,\mathrm{kW\,h\,m^{-1}}$ (note the behaviour of `siunitx`: (absence of) thin space between 'W' and 'h').
In tables, the units should **not be between square brackets**. Correct usage of the brackets: $[F] = \mathrm{N}$, so you hardly ever want to use that. If you want, you can put the units between normal parens ().

3. Subscripts

Subscripts in math should in most of *our* cases be **upright**. Why? Because a subscript in italic has a mathematical meaning; an upright subscript is just simple text, meaning a word or abbreviation of something. To write an upright subscript, use `\text`, e.g. `$k_\text{eff}$`, k_{eff}.

Symbols	Meaning
E_x	electric field in x direction
E_{plate}	electric field due to some charged plate
k_{eff}	k with indices e, f, and f. So e.g. k_{122}
k_{eff}	effective k (e.g. an effective spring stiffness)
n_i	n with index i, e.g. $\sum_{i=1}^{10} n_i$
n_{i}	n with subscript abbreviation 'i', perhaps intrinsic carrier concentration
m_{e}	electron mass
k_B	some k having to do with a magnetic field B?
k_{B}	$= 1.380\,650\,4(24) \times 10^{-23}\,\text{J}\,\text{K}^{-1}$
E_{xmax}	yuk!
$E_{x,\text{max}}$	neat!
$\int_{allspace}$	lots of indices!
$\int_{\text{all space}}$	superb

4. Misc math stuff

Symbols	Meaning
$cos(2\pi)$	c times o times $s(2\pi)$ (probably s is a function)
$\cos(2\pi)$	$= 1$
$\cos^{-1}(2\pi)$	$= 1$
$\arccos(2\pi)$	argument 2π is outside the domain of the inverse cosine function
$exp(\ldots)$	e times x times $\ldots$
$\exp(\ldots)$	$e^{\cdots}$, this is probably what you meant

5. Approximately, proportional to, plus-minus

If something (for example, a measurement error or actuation range) ranges from $-50\,\mu\text{m}$ to $50\,\mu\text{m}$, you write that as `\SI{+-50}{\micm}`, $\pm 50\,\mu\text{m}$. If something is approximately $50\,\mu\text{m}$, you write `$\sim$\SI{50}{\micm}`, $\sim 50\,\mu\text{m}$, or `$E \sim 5$`, $E \sim 5$, or `$E \approx 5$`, $E \approx 5$. If E is proportional to T, you write `$E \propto T$`, $E \propto T$.

6. Quotes

Use **double quotes** for **real quotations**, i.e. text that has actually been said or written. "For example," Johan said. Use **single quotes** for **'strange'** words. Note that the start and end quotes are different! Use `` ` `` at the start, and `'` at the end.

[Beccari(1997)] Beccari C, 1997 "Typesetting mathematics for science and technology according to ISO 31/XI" *TUGboat* **18**, pp. 39–48 URL http://www.tug.org/TUGboat/Articles/tb18-1/tb54becc.pdf