

# CONTENTS

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These slides can be found at  
<http://baasil.stats.mu.oz.au/Mums>

## WHY L<sup>A</sup>T<sub>E</sub>X ?

- advanced typesetter particularly useful for mathematical text
- universal for presentation of technical documents
- need not worry much about the formatting of information

## USEFUL REFERENCES

- Lamport — *L<sup>A</sup>T<sub>E</sub>X A document Preparation System*.
- Goossens, Mittlebach and Samarin — *The L<sup>A</sup>T<sub>E</sub>X Companion*
- <http://www.cl.cam.ac.uk/CTAN/latex/>  
— can access ftp site from here
- [http://www.emerson.emory.edu/services/latex/latex\\_toc](http://www.emerson.emory.edu/services/latex/latex_toc)  
— L<sup>A</sup>T<sub>E</sub>X Help 1.1

## GETTING STARTED

In a file with suffix `.tex` (e.g. `“blah.tex”`):

```
\documentclass{article}
```

```
\begin{document}
```

```
Type some text.
```

```
\end{document}
```

The document is formatted by typing:

```
> latex blah.tex
```

A dvi (device independent) file `“blah.dvi”` is created.

Alternative document classes are: `report`, `book`, `slides`, `seminar`.

## NEXT STEP

View the formatted result:

```
> xdvi blah.dvi
```

(Type q to quit)

Finally print the document:

```
> dvips -o blah.ps blah.dvi  
> lpr -P<printer name> blah.ps
```

A postscript file “blah.ps” is created and then printed.

## ANOTHER EXAMPLE

```
\documentclass[12 pt, a4paper] {article}
\usepackage{latexsym}

\begin{document}
\section{Section heading}
Here is some text in normal style.
\emph{Emphasised text}

\textbf{Some bold text in a new paragraph.}
{\large Some larger text on
the same paragraph.}

\subsection{A subsection}
  Weren't there      more spaces in this line?
\begin{center}Some centered text.\end{center}
{\huge That'll be all folks!}

\end{document}
```

## OTHER STYLES

`{\small hello}`

`{\huge hello}`

`\textit{hello}`

`\textsl{hello}`

`\textsc{hello}`

`\textbf{hello}`

`\texttt{hello}`

`\verb+ hello +`

## MORE ON SECTIONING

Other section commands:

```
\part \chapter  
\section \subsection  
\subsubsection \paragraph
```

```
\begin{abstract}  
...  
\end{abstract}
```

Lists can be generated using:

```
\begin{itemize}  
\item first point  
\item second point  
\end{itemize}
```

The `enumerate` command produces a numbered list.

## LAST EXAMPLE FROM ME

```
\documentclass{article}
\newcommand{\ti}{\times}

\begin{document}

\newtheorem{easy}{Lemma}

\begin{easy}[Rao's Result]
There are $604800$ seconds in a week.
\end{easy}

\textbf{Proof}
\[60 \ti 60 \ti 24 \ti 7 = 604800\]
\flushright{\bf QED}

\end{document}
```

## A FEW OTHER TIPS

- When running  $\text{\LaTeX}$  try to locate as many errors as possible before re-running.
- Common mistakes: missing `\end` after `\begin`, missing `$`, `{` or `}`, typos in commands, unintentional use of special characters such as `$`)
- use `%` for comments (rest of line including newline character ignored)
- If you wish to introduce your own formatting:
  - force line breaks using `\\`
  - vertical spaces: `\vspace{0.5in}`
  - horizontal spaces: `\hspace{0.5in}`

## MATHEMATICAL FORMULAE IN L<sup>A</sup>T<sub>E</sub>X

Entering mathematical formulae in documents prepared in L<sup>A</sup>T<sub>E</sub>X is both easy and logical.

Entering a formula in the middle of a sentence can be done using the command `$ formula $`. To get  $e^{i\pi} = -1$ , type: `$e^{i\pi}=-1$`.

For larger mathematical equations, enclose formulae between `\[` and `\]` or between `\begin{displaymath}` and `\end{displaymath}`. This produces formulae that are not numbered.

For successive equations to be numbered, use the `equation` environment.

Example: typing `\[ c^2 = a^2 + b^2 \]` gives

$$c^2 = a^2 + b^2$$

Contrast these two expressions:

`\$ \lim_{x \to 0} \frac{\sin x}{x} = 1 \$`

which gives  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$

`\[ \lim_{x \to 0} \frac{\sin x}{x} = 1 \]`

which gives

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

Using the `equation` environment gives:

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1 \quad (1)$$

We can name the equation label with this input:

```
\begin{equation}
\lim_{x \to 0} \frac{\sin x}{x} = 1
\label{CleverEqn}
\end{equation}
```

and then use refer to it in the text below:

Wirth referred to equation~(\ref{CleverEqn})...

Wirth referred to equation (??)...

If you wish to align equations, say at equalities, use the `eqnarray` environment and align characters by placing them between ampersands (&).

e.g.

```
\begin{eqnarray*}
v & = & (x+y)^2 \\
& = & x^2 + 2xy + y^2
\end{eqnarray*}
```

which gives

$$\begin{aligned} v &= (x + y)^2 \\ &= x^2 + 2xy + y^2 \end{aligned}$$

The `*` on `eqnarray*` tells  $\text{\LaTeX}$  not to number equations.

Text can be included using `\mbox{}`.

`\[ \mbox{for all} \ x \in I \]`

for all  $x \in I$

Other text styles:

`\mathit`, `\mathrm`, `\mathbf`, `\mathsf`,  
`\mathtt`, `\mathcal`.

Note that `\mathcal{F}` gives  $\mathcal{F}$ .

The `\` in the above equation places an extra space in equations.

Other spacing commands include `\`, `\quad`,  
`\qquad`, `\; \`, `\: \!`. The command `\!` actually gives you a negative thin space.

When grouping several characters together such as in  $x^{2(x+y)}$ , we place them in braces `{}`. `\$x^{2(x+y)}\$`.

## Greek Characters

These characters are very common and are built into  $\text{\LaTeX}$ . They are entered in *math mode only* and are entered in as `\alpha`, `\beta`, `\gamma`, `\Gamma` for lower case:  $\alpha, \beta, \gamma$  and `\Delta`, `\Sigma`, `\Gamma` for uppercase  $\Delta, \Sigma, \Gamma$ .

## Exponents and Subscripts

These can be specified using `^` for superscripts and `_` for subscripts.

$$e^{\{x^2\}} \text{\neq} \{e^x\}^2 \quad e^{x^2} \neq e^{x2}$$
$$a_{\{ij\}}^n \quad a_{ij}^n$$

## Square Roots

The square root is entered as `\sqrt{\}` and the  $n^{\text{th}}$  root is generated with `\sqrt[n]{\}`.

$$\sqrt{\{b^2 - 4ac\}} \quad \sqrt{b^2 - 4ac}$$
$$\sqrt[3]{\{x^2 + \sqrt{y}\}} \quad \sqrt[3]{x^2 + \sqrt{y}}$$

## Other Symbols

Some symbols which you may find useful include:

`\infty`,  $\infty$ , `\sin`,  $\sin$ , `\lim`,  $\lim$  (as seen earlier), `\log`,  $\log$ .

Compare `\log`,  $\log$ , to `log`,  $\log$ .

Overlines, hats, dots, tildes, bars etc can be placed above characters:

`\hat{x}`, `\dot{x}`, `\overline{x}`, `\vec{x}` give  $\hat{x}$ ,  $\dot{x}$ ,  $\bar{x}$ ,  $\vec{x}$ .

`\vec{}` is used for vectors.

You can also use `\widetilde` and `\widehat` to place these over several variables. For example  $\widehat{ab}$ .

Primes can be included by using `'` as in `y''` which gives  $y''$ .

Fractions are typeset neatly in L<sup>A</sup>T<sub>E</sub>X using `\frac{}{}`.

e.g. `\frac{a^{\sin x}}{\cos x^{\frac{2}{3}}}`

gives us  $\frac{a^{\sin x}}{\cos x^{\frac{2}{3}}}$ .

Stacking symbols can be done using `\stackrel{}{}`.  
`X \stackrel{d}{=} Y` yields  $X \stackrel{d}{=} Y$ .

Three dots arranged as indicated:

`\cdots`, `\cdots`, `\vdots`, `:`, `\ddots`, `\ddots`; and `\ldots`,  
... which can be used outside the `math` environment.

## Binary Relations

`\geq`, `\leq`, `\ll`, `\parallel`, `\approx`, `\subset`,  
`\subseteq` etc. give  $\geq$ ,  $\leq$ ,  $\ll$ ,  $\parallel$ ,  $\approx$ ,  $\subset$ ,  $\subseteq$ .

The command `\not` is also very useful:

`x \not < y` is displayed as  $x \not < y$ .

We can use `\neq` for  $\neq$ .

## Sums and Integrals

These are generated with `\sum`,  $\Sigma$  and `\int`,  
 $\int$ . So we can typeset:

`\sum_{i=1}^{\infty}` and `\int_0^{\frac{\pi}{2}}`.

$$\sum_{i=1}^{\infty} \quad \int_0^{\frac{\pi}{2}}$$

## Matrices and Arrays

Use array environment.

```
\begin{displaymath}
\mathbf{X}=
\left( \begin{array}{ccc}
x_{11} & x_{12} & \ldots \\
x_{21} & x_{22} & \ldots \\
\vdots & \vdots & \ddots
\end{array} \right)
\end{displaymath}
```

$$\mathbf{X} = \begin{pmatrix} x_{11} & x_{12} & \cdots \\ x_{21} & x_{22} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

Note the commands `\left(`, `\right)` which yield the large parentheses for the matrix. Similarly, you can use `\left[`, `\left\{`.

## FIGURES & TABLES

- Figures

```
\begin{figure}[htbp!]  
  <The body of the figure>  
  \caption{The caption}  
\end{figure}
```

- Tables

```
\begin{table}  
  ...  
\end{table}
```

## THE GRAPHICX PACKAGE

- Include `\usepackage{graphicx}` in the preamble
- Then to include the eps (encapsulated postscript) file "file.eps", type  
`\includegraphics[scale=4.12]{file.eps}`

Information for this package can be found in  
`/local/zennor/teTeX/texmf/doc/latex/ graphics/grfg`

## GENERATING ENCAPSULATED POSTSCRIPT

- xfig
- Adobe Photoshop
- PGPLOT

## PAGE STYLES

- Plain

```
\pagestyle{plain}
```

- Empty

```
\pagestyle{empty}
```

- Fancy

```
\usepackage{fancyhdr}  
...  
\pagestyle{fancy}  
\lhead{\textsl{Paradox}}  
\chead{Issue 2, 1998}  
\rhead{Page \thepage}  
\cfoot{}
```

## TABLES

```
\begin{tabular}{format}  
...  
\end{tabular}
```

where each column is coded by `l`, `c` or `r` in the *format* corresponding to its alignment.

You may also place a `|` character between the letter codes for a vertical line between the columns.

For example: `||l|lr||`

Each line of the table should contain:

```
<item> & <item> & <item> & ... & <item> \\
```

For a horizontal line use `\hline`. If you only want it from columns *i* to *j* inclusive do `\cline{i-j}`.

You might like to surround the whole thing with `\begin{center} ... \end{center}` or `\begin{table} ... \end{table}`

## EXAMPLE TABLE

```
\begin{center}
\begin{tabular}{||l|lr||} \hline
Crown & price & \$1.40 \\ \cline{2-3}
      & dividend & 22.3c \\ \hline
Telstra & price & \$4.20 \\ \hline
\end{tabular}
\end{center}
```

Crown	price	\$1.40
	dividend	22.3c
Telstra	price	\$4.20

## TYPED TEXT

To type computer code or  $\text{\LaTeX}$  commands, use the environment

```
\begin{verbatim} ... \end{verbatim}
```

$\text{\LaTeX}$  will follow your formatting and will interpret `#!&$_\^~` literally.

To produce Chaitanya<sub>□</sub>Rao, use the `verbatim*` environment.

BTW `\LaTeX` makes  $\text{\LaTeX}$ .

## BIBLIOGRAPHIES

Every time you cite a document you should refer to its *key*. You use it like this:

Rao~\cite{Paradox96} claimed ...

which will appear in the text as

Rao [2] claimed ...

You can refer to more than one work at once and can add optional page numbers (although normally these wouldn't be done simultaneously).

Rao, Teague and Glick~\cite[pp 5,8,13]{Par96, Par97, Par98} ...

to produce

Rao, Teague and Glick [2,3,4, pp 5,8,13] ...

## BIB<sub>T</sub>E<sub>X</sub>

Create bibliography files of the form `blah.bib` which contain entries like this

```
@BOOK{ nobeer,           %the key
AUTHOR = "L. Ip and C. Rao and A. Cagliarini",
TITLE = "No beer please, we're mathematicians",
PUBLISHER = {MUMS},
ADDRESS = {Melbourne},
YEAR = 1998
}
```

To refer to this in the `.tex` file we use `\cite{nobeer}`.

Other possible entries are

`ARTICLE`, `INBOOK`, `INPROCEEDINGS`, `PHDTHESIS`

and other possible fields are `VOL`, `NUMBER`.

To specify which bibliography (.bib) files are to be used, type `\bibliography{nerds,newspapers}` anywhere in the `tex` file.

You also need to indicate the type of formatting you want for the bibliography.

Its probably best just to use `\bibliographystyle{plain}`.

Then the sequence of commands is:

```
> latex blah.tex
> bibtex blah
> latex blah.tex
> latex blah.tex
```

Note that the `bibtex` command will create a file called `blah.bbl`.

## INDEXES

Every time you want an index reference insert `\index` in the text. For example

```
The Treasurer \index{Cagliarini} believed
that shares \index{Shares}...
```

Note the argument to the `index` command does not appear in the output, only in the index, and that it should be as close as possible to the text to which it refers.

To make subentries in the index do

```
... that shares \index{Shares!Crown} ...
```

which will produce

Shares, 2

    Crown, 7

Subsubentries are allowed using two `!`s but no more nesting than that.

To use the *MakeIndex* utility

Place the following in the preamble—that is between `\documentclass{...}` and `\begin{document}`:

```
\usepackage{makeidx}  
\makeindex
```

and place `\printindex` where you want the index to appear in the document.

Then the commands are:

```
> latex blah.tex           % produces blah.idx  
> makeindex blah          % produces blah.ind  
> latex blah.tex
```

If there are errors it's best to edit the `blah.tex` file rather than the `blah.ind` file.

## SPLITTING THE INPUT

You can split up your input among many `.tex` files. If you do then you should incorporate them into a single file like this:

```
\documentclass{article}
\begin{document}
\input{file1.tex}
\input{file2.tex}
...
\input{lastfile.tex}
\end{document}
```