

MAS115 PRESENTATION LAB 5

Start a new file in either TeXworks or TeXmaker (whichever you prefer), copying the preamble from your most recent document (or use the preamble template on the course website).

1. FURTHER L^AT_EX COMMANDS

This week we'll cover a mixed-bag of extra L^AT_EX features that haven't appeared in the labs so far. In a section called 'Further LaTeX commands', start an `enumerate` environment and enter the following as items.

- (1) Try 'This is the `\LaTeX` logo'. Try removing the second `\`. Why was it needed?
(The command '`\` ' (backslash followed by a space) is a command to insert a blank space of standard inter-word width. There are other variants which give slightly different widths, such as `\` , (a thin space), `\quad` (a large space) and `\qquad` (a very large space).)
- (2) Enter 'Let `$$x=u+v\text{and}y=u-v.$$`. Experiment with `\quad` and `\qquad` to add some extra space either side of the `and`.
- (3) Try entering

```
This will display  
% but here is a comment.
```
- (4) Try 'This will make text `\texttt{computery}`'.
- (5) Put `\usepackage{url}` in your preamble, then try entering the command '`\url{bbc.co.uk/index_1.htm}`'. Does `\texttt` work here instead? If not, what's causing the problem?
- (6) Try using `\texttt` to get L^AT_EX to display `\begin{document}` on the PDF. Does it work? If not, try entering '`\verb!\begin{document}!`'.
(The `\verb!...!` command allows inline verbatim text.)
- (7) Try entering

```
G\"odel created a true yet unprovable mathematical  
statement\footnote{See Wikipedia for more details.}.
```
- (8) Try entering

```
Let's switch to inline maths: \(\x^2=1\) and display-math:  
\[x^2=1\] using an alternative method.
```


(This method of switching to math-mode is thought by some as more correct for reasons which I won't go into. Feel free to use these or `$`-signs as you prefer.)
- (9) Try putting `\tableofcontents` after your `\maketitle` command. Process the L^AT_EX twice. Add some extra sections and subsections to the bottom of your document, and reprocess.

- (10) Try changing some of the `\section{...}` commands in your document to `\section*{...}`. Experiment with the commands `\subsection*` and `\subsubsection*`. What happens?
- (11) Type ‘The symbol for the real numbers is \mathbb{R} ’. Now, go to the preamble to your file and enter `\newcommand{\R}{\mathbb{R}}`. Go back to the earlier sentence and change `\mathbb{R}` with `\R`. (Here, you’ve created your own L^AT_EX command. This can be quite handy for shortening commands that you write frequently.)

Some of the above may be useful to you!

1.1. Aligned equations. Something that’s well overdue is a guide on how to align equations. Start a section called ‘Aligned equations’ and typeset the following.

```
Since  $e^{it} = \cos t + i \sin t$ , it follows that
\begin{align*}
(\cos t + i \sin t)^n &= (e^{it})^n \\
&= e^{int} \\
&= \cos(nt) + i \sin(nt).
\end{align*}
```

Try removing the `*`, but put it back afterwards. Here, the `align` environment has switched to `display-math` and has lined up all of the `=`-signs. Note that each line is ended with `\\` and the things that are lined up on each line are preceded with an ampersand `&`. The unstarred version numbers the equations, and you can use `\label{...}` and `\ref{...}` to refer to them if required.

1.2. Tables and arrays. Creating tables with L^AT_EX is easy, and uses the `tabular` environment. In a section called ‘Tables’, try the following.

```
\begin{center}
\begin{tabular}{llr}
\hline
Name & Brewery & Strength \\
\hline
Pale Rider & Kelham Island & 4.3\% \\
Moonshine & Abbeydale & 3.6\% \\
\hline
\end{tabular}
\end{center}
```

You should find you have a nice-looking table. Try doubling the second instance of `\hline`. Now think about the following.

- (12) What do the `&`-signs do here? What about the `\\` commands?
- (13) Try changing the `{llr}` to `{ccr}`, or `{llc}`, or any other three-letter combination of `l`, `c` and `r`.

(The parameter `{l1r}` specifies three columns with the text justified to the left in the first and second columns and to the right in the third. Using `c` gives a centred column.)

- (14) Change the parameters again to `{|l|l|r|}`. What's changed? Change it back.

(Most style guides recommend avoiding the use of vertical lines in tables.)

Notice that the tabular environment is in text-mode. That is, text displays as text. If you want maths as table entries you need to use dollar signs. For a table (or array) that consists entirely of maths, it's better to use the `array` environment. Try it out with the array below, filling in the right-hand column.

```

$$
\begin{array}{c|c}
f(x) & f'(x) \\ \hline
x^2 & \\
e^x & \\
\tan x & \\
\end{array}
$$

```

If you think the array needs stretching out a bit, this is possible by putting `\renewcommand{\arraystretch}{1.5}` before `\begin{array}`. The same command in the preamble will stretch every table and array in your document.

1.3. The listings package. As mentioned in an earlier lecture, inserting large chunks of computer code can be done with the `enumerate` environment, but there is a better option.

Start a new section called 'Inserting computer code' and put insert an introductory paragraph reading 'The code below is an implementation of the 'Higher and Lower' game'. Go to the course webpage, and download the `higher_lower.py` file. (Feel free to try it out in IDLE if you haven't already!) Copy and paste the text into your document inside a `verbatim` environment. How does it look?

Let's improve things.

- (15) Add `\usepackage{listings}` to your preamble, and just below this `\lstset{breaklines=true}`. Change change the `verbatim` environment to `lstlisting` (be careful with the typing!) and process the file. This should have dealt with lines spilling off the page.
- (16) Edit your `\lstset` command to `\lstset{breaklines=true,language=Python}`.
- (17) Try adding the options `basicstyle=\footnotesize`, `showstringspaces=false`, `frame=single`, `numbers=left` and see their effect.
- (18) Google 'listings include code texblog' and look at other options you can use in the top search result.

2. FURTHER READING

This part of this course could go on almost indefinitely, as there are endless amounts of \LaTeX packages and commands to use and experiment with. If there are things you need to do which haven't been covered so far, they will probably appear in the excellent *Short Introduction to \LaTeX* found at

<http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>

Another very useful resource is the \LaTeX Wikibook, which lives at

<http://en.wikibooks.org/wiki/LaTeX>

This is probably more useful as a reference guide to a specific topic.

Of course, don't forget Google!

HOMEWORK

Create a document with title 'MAS115: Homework 5' and your name on as author. You should have received marked homework from your personal tutor for MAS110 this week. Your task is to type up a solution to that homework (Chapter 2 Q10(ii), Chapter 3 Q5) using their comments and discussions from your tutorial to give good solutions.

- Remember, there should be a difference in style between handwritten and typed solutions.
- Make sure your \LaTeX doesn't just look like a photocopy of your handwritten version.
- Use full sentences and only use display-math when appropriate.
- The align environment will be useful, especially in Q5.

You should use `question` and `solution` environments, which you can create by putting the following in your preamble.

```
\newenvironment{question}{\textbf{Question}.}{\end{question}}
\newenvironment{solution}{\begin{proof}[Solution]}{\end{proof}}
```

Then, if you enter

```
\begin{question}
Use induction to show that ...
\begin{solution}
Let  $P(n)$  be the statement ...
\end{solution}
\end{question}
```

you will find a question with a solution.

Hand the homework in at next week's Friday lab, as usual.