COMP516 Practical 6
(non-assessed)
4 November 2008

This practical continues last week's LaTeX practical. You have started to work on the following LaTeX document from Jon Warbrick's 'Essential LaTeX', which you have stored under the name `small.tex`.

```
% small.tex -- Released 5 July 1985
% USE THIS FILE AS A MODEL FOR MAKING YOUR OWN LaTeX INPUT FILE.
% EVERYTHING TO THE RIGHT OF A % IS A REMARK TO YOU AND IS IGNORED
% BY LaTeX.
%
% WARNING! DO NOT TYPE ANY OF THE FOLLOWING 10 CHARACTERS EXCEPT AS
% DIRECTED: & $ # % _ { } ^ ~ \
\documentclass{article}% YOUR INPUT FILE MUST CONTAIN THESE
\begin{document} % TWO LINES PLUS THE \end COMMAND AT
                 % THE END

\section{Simple Text} % THIS COMMAND MAKES A SECTION TITLE.

Words are separated by one or more spaces. Paragraphs are
separated by one or more blank lines. The output is not affected
by adding extra spaces or extra blank lines to the input file.

Double quotes are typed like this:   quoted text  .
Single quotes are typed like this:  single-quoted text .

Long dashes are typed as three dash characters---like this.

Italic text is typed like this: \textit{this is italic text}.
Bold text is typed like this: \textbf{this is bold text}.

\subsection{A Warning or Two} % THIS MAKES A SUBSECTION TITLE.

If you get too much space after a mid-sentence period---abbreviations
like etc.\ are the common culprits)---then type a backslash
followed by a space after the period, as in this sentence.

Remember, don't type the 10 special characters (such as dollar sign and
backslash) except as directed! The following seven are printed by
typing a backslash in front of them: \$ \& \# \% \_ \{ and \}.
The manual tells how to make other symbols.
\begin{flushleft}
Mr. Smith (without backslash)\\
Mr.\ Smith (with backslash)\\
Proc. IJCAI (without backslash)\\
Proc.\ IJCAI (with backslash)
\end{flushleft}
\end{document} % THE INPUT FILE ENDS LIKE THIS
```

1. Sometimes you want to refer to past or future sections, theorems, or equations in your text. Instead of explicitly typing in the section number, theorem number or equation number, which might change as you edit your text, LaTeX uses the `\label` macro to attach a label to a particular section, list item, theorem, or equation, and allows you create references using the `\ref` and `\pageref` macros.

   Here is an example. In `small.tex` add the following lines **before** the line `\end{document}`:

   ```
   \section{Indices, references, and citations}
   \subsection{References}
   We will define a label for our section on 'Labels', which is
   section \ref{References} on page \pageref{References} in this document.
   Watch how the section number changes as we insert additional sections later on.
   \subsection{Labels}\label{References}
   ```

2. Save the file and execute `latex small` in a terminal window.
   Observe that the diagnostic output, which is also written to the file `small.log`, includes some warnings:

   ```
   LaTeX Warning: Reference 'References' on page 1 undefined on input line 40.
   LaTeX Warning: Reference 'References' on page 1 undefined on input line 40.
   LaTeX Warning: There were undefined references.
   LaTeX Warning: Label(s) may have changed. Rerun to get cross-references right.
   ```

The reason for these warnings is that when LaTeX comes across the macros `\ref{References}` and `\pageref{References}` it does not yet know what to replace them with.

3. Execute `latex small` again. The warnings will disapppear. Have a look at small.dvi (or process the DVI file further to obtain a PostScript or PDF file and have a look at those). The occurrence of `\ref{References}` has been replaced by '2.2' and the occurrence of `\pageref{References}` by '1'.

4. Labels can be put almost anywhere, they don't need to put right after a sectioning macro. For example, insert the text below into your LaTeX file just before the line `\section{Indices, references, and citations}`:

```
\section{Lists}
\subsection{Enumeration lists}
This is an example of the enumerate environment, which
produces a numbered list, inside a figure.
\begin{figure}[b]
  \begin{enumerate}
  \item This is the first item in the list\label{e1}
  \item This is the second item in the list\label{e2} and we can nest
    environments
    \begin{enumerate}
    \item This is the first item in the second-level enumerate
      environment
    \item This is the second item\label{e3}
    \end{enumerate}
  \end{enumerate}
  \caption{Enumerated environment in a Figure\label{f1}}
\end{figure}
We are able to refer to the items in this list as items \ref{e1},
\ref{e2}, \ref{e3} in Figure~\ref{f1}. Note that the figure occurs
at the bottom (or top) of the page, not where you've placed it in the
\LaTeX{} file.
```

5. Save the file, execute `latex small` **twice** in a terminal window, and have a look at the resulting document. Observe where the figure has been placed, how the items of the list have been numbered and how the references have been resolved.

6. If you want to learn more about enumeration environments, have a look at
`http://www.tug.org/tetex/tetex-texmfdist/doc/help/faq/uktug-faq/FAQ-enumerate.html`

7. For bullet point lists, LaTeX uses a different environment, namely the `itemize` environment. Here is an example:

```
\subsection{Itemize lists}
The following generates a bullet point list:
\begin{itemize}
\item This is the first item in the list; as for enumerate, you can
  nest itemize environment\label{i1}
  \begin{itemize}
  \item This is the inner itemize environment\label{i2}
  \end{itemize}
\item This is the second item in the outer itemize environment\label{i3}
\end{itemize}
What do the references \ref{i1}, \ref{i2}, or \ref{i3} refer to?
```

Insert this text just **before** the line `\section{Indices, references, and citations}` into your LaTeX file. Save the file, execute `latex small` **twice** in a terminal window, and have a look at the resulting document. What do the references `\ref{i1}`, `\ref{i2}`, `\ref{i3}` resolve to and why?

8. A third type of list making environment is `description`. In a `description` list the item labels are specified inside square brakets after an `\item` macro. This environment is intended to be used to define or describe various terms, i.e. the terms which form the item labels. For example:

```
\subsection{Description lists}
This a description list:
\begin{description}
\item[Semantic web] Berners-Lee's idea of the next generation web.
\item[Web 2.0] O'Reilly's characterisation of the next generation web.
\end{description}
```

   Insert this text **before** the line `\section{Indices, references, and citations}` into your LaTeX file. Save the file, execute `latex small` **twice** in a terminal window, and see how the `description` environment is typeset.

9. The `quote` environment is used to typeset quotations, for example:

```
The following is an extract from (Wolper 1996a):
\begin{quote}
  Consider, for instance, the issue of compositionality in proof systems
  for concurrency. I am not going to argue that compositionality is
  undesirable, but that achieving it without algorithmic support (in
  a broad sense) is easy and mostly useless.
\end{quote}
```

   Add this text **before** the line `\section{Indices, references, and citations}` to your LaTeX file. Save the file, execute `latex small` **once** in a terminal window, and see how the `quote` environment is formatted.

10. In step 1 of this practical we had given a label `References` to the subsection 'Labels' of the section 'Indices, references, and citations' and we have seen in step 3 that `\ref{References}` has been replaced by '2.2' and the occurrence of `\pageref{References}` by '1'.

    In steps 4 to 9 we've inserted a section entitled 'Lists' before the section 'Indices, references, and citations' and we have included a lot of material into this new section.

    So, `\ref{References}` should now resolve to '3.2', as an additional section has been added in front of it, and `\pageref{References}` should resolve to '2', as the material now appears on page 2 of the typset document. Check that this is the case.

11. A table of contents, list of figures, and list of tables can easily be generated by using the macros `\tableofcontents`, `\listoffigures`, and `\listoftables`, respectively. Typically, these should appear right at the start of your document. So, insert these three macros into `small.tex` right after the line `\begin{document}` and save the file.

    Executing `latex small` once now will not be enough. During the first execution after inserting the three macros, LaTeX will generate three additional files, `small.toc`, `small.lof`, and `small.lot` for contents, figures, and tables, respectively. Only another execution of `latex small` will include those files into the typeset document. So, execute `latex small` at least twice and have a look at the result.

12. For longer documents, like book chapters, books, theses, an *index* is often useful for the reader. To be able to create an index, add

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

before the line `\begin{document}` to `small.tex` and add

```
\printindex
```

before the line `\end{document}`. Now everything is ready for you to define index entries. You do so by using `index` macros, e.g. `\index{Index Entry}`. Add the following text before `\section{Indices, references, and citations}`:

```
\subsection{Indexing}
We want to create some index entries\index{research methods}%
\index{methods!research}\index{research|see{methods}}.
```

Execute `latex small` once. This will create a new file, `small.idx`, containing the index entries. However, some more pre-processing is required before they are ready to be typeset. You have to execute `makeindex small.idx` which creates a file `small.ind` from `small.idx`, which will then be included into `small.tex` the next time you execute `latex small`. Do so now and have a look at the index entries which will be at the end of the typeset document. Just as for references, the page numbers in the index entries will be updated each time you run `latex`, but the update will only become visible once you've used `makeindex` and `latex` once more. Additional information on indices can be found at

`http://web.image.ufl.edu/help/latex/latex_indexes.shtml`

This concludes today's practical. A topic you might want to look into on your own time is how to include graphics into LaTeX documents using `\includegraphics` (Section 6.3 of Greenberg's 'A Simplified Introduction to LaTeX', see last week's practical for bibliographic details).