

# COMP516 Practical 7: $\text{\LaTeX}$ (Cross-references and indices)<sup>1</sup> 2012-11-16

This practical continues last week's  $\text{\LaTeX}$  practical. You have started to work on the following  $\text{\LaTeX}$  document from Jon Warbrick's 'Essential  $\text{\LaTeX}$ ', available at

<http://cgi.csc.liv.ac.uk/~dominik/teaching/comp516/misc/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,  $\text{\LaTeX}$  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 new content of `small.tex` and create a PDF file from the  $\text{\LaTeX}$  source just by pressing Control-F7, and view the result by pressing F5. Alternatively, build the PDF using a Terminal window by running `pdflatex small.tex`. Observe that the diagnostic output in both cases may include some warnings:

---

<sup>1</sup> This document can be found at

<http://cgi.csc.liv.ac.uk/~dominik/teaching/comp516/practicals/practical7.pdf>

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  $\TeX$  comes across the macros `\ref{References}` and `\pageref{References}` it does not yet know what to replace them with.

3. If you press Control-F7 or run `pdflatex small.tex` again, the warnings will disappear. 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  $\TeX$  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, and press Control-F7, and have a look at the resulting document using F5. 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,  $\TeX$  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  $\text{\LaTeX}$  file. Save the file, press Control-F7 or run `pdflatex small.tex` in a Terminal window **twice**, 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 brackets 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  $\text{\LaTeX}$  file. Save the file, build the PDF file again, 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  $\text{\LaTeX}$  file. Save the file, build the PDF file again, 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 typeset 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.

When building the PDF file using a Terminal window, executing `pdflatex small.tex` once now will not be enough. During the first execution after inserting the three macros,  $\text{\LaTeX}$  will generate three additional files, `small.toc`, `small.lof`, and `small.lot` for contents, figures, and tables, respectively. Only another execution of `pdflatex small.tex` will include those files into the typeset document. So, execute `pdflatex small.tex` at least twice and have a look at the result. Alternatively, in TeXnicCenter it suffices to press Control-F7 once (or twice under some settings) and view the result with F5.

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}}.
```

If using a Terminal window, execute `pdflatex small.tex` 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 `pdflatex small.tex`. 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 `pdflatex`, but the update will only become visible once you've used `makeindex` and `pdflatex` once more. When using TeXnicCenter pressing Control-F7 should perform all these steps automatically for you. Once it is done press F5 to see its output PDF file.

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