LaTeX: An Introduction (Part 2)

University Graduate College Training Course

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Notes

Introduction

- Recap of Beginners LaTeX
- Floating Environments
- Cross Referencing
- BibTeX
- Defining Custom Environments
- Defining Custom Commands
- Presentations
  - Beamer class
  - Creating slides

Notes

Schedule

09:00 - 09:15	Welcome & Introduction
09:15 - 10:30	Basic LaTeX, Exercise 1, Floats, `figure` environment, Exercise 2
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	Referencing with BibTeX, Exercise 3
12:30 - 13:30	**Lunch**
13:30 - 15:00	Presentations in LaTeX- `beamer`
15:00 - 15:30	**Coffee Break**
15:30 - 17:00	Preamble, Custom Environments & Commands, Exercises, LaTeX helpdesk
17:00	Close

Notes

LaTeX Recap

Hopefully, everyone is happy with these LaTeX concepts:

- Writing LaTeX files
- Document Classes & Structure
- Packages
- Sections & Chapters
- Text Formatting
- Tables
- Lists
- Typesetting Maths

Notes

Recap - Writing LaTeX Files

Creating documents with LaTeX is simple:

1. Write our document as plain text in a '`.tex`' file, using LaTeX commands to structure and format it
2. Compile our '`.tex`' file to produce the output

Notes

Recap - First (basic) LaTeX Example

```
\documentclass{article}
   % Preamble goes here
   \begin{document}
      % Document content goes here
      Hello World!
   \end{document}
```

Hello World!

Notes

Recap - Writing LaTeX – Commands

LaTeX commands have an effect on the text in the document. Some commands have additional arguments or optional parameters. The general syntax for a LaTeX command is:

```
\commandname[opt1, opt2, ...]{arg1}{arg2}...
```

Notes

Recap - Writing LaTeX – Commands & Whitespace

Whitespace after LaTeX commands will generally be ignored. If you need a space after a command, you can either add an empty parameter to the command, or use a (breaking or non-breaking) space command.

```
\LaTeX commands will ignore whitespace after them.\newline
We can force a space after a \LaTeX{} command using an empty
parameter. \\
Or we can use a space command (texttt{\ } or \texttt{~} )after
our \LaTeX\ command.
This way our \LaTeX~commands and text do not flow together!
```

LaTeXcommands will ignore whitespace after them.
We can force a space after a LaTeX command using an empty parameter.
Or we can use a space command (texttt or)after our LaTeX command.
This way our LaTeX commands and text do not flow together!

Notes

Recap - Writing LaTeX – Comments

The '%' character is used to create comments in LaTeX. When LaTeX is processing your .tex file and it comes across a '%', it ignores the rest of the line.

```
%This is a comment and will not be shown.
Here is some text in our file that will be shown. %but the rest
of the line will not be.
We can even do things like br%
eak words up with comm%
ents if we want to.
```

Here is some text in our file that will be shown. We can even do things like break words up with comments if we want to.

Notes

Recap - Compiling

That's more than you need to create a basic `.tex` file and create your first document.

To compile your `.tex` file and create your document, you use a LaTeX compiler:

- `latex` calls the `tex` compiler and outputs `.dvi` files
- `pdflatex` calls the `pdftex` compiler and outputs `.pdf` files

Notes

Recap - Compiling

Compiling creates a lot of extra files, including the output of your document. All of these files are recoverable and can be remade by re-compiling, so can be deleted safely.

The only files you always need to keep and should not delete are `.tex`, `.cls`, `.sty`, `.bib` and `.bst`.

Notes

Recap - Document Structure

Every LaTeX document must have a certain structure:

```
\documentclass{...}
% Preamble here
\usepackage{...}
\begin{document}
    % Document contents here
    ...
\end{document}
```

The area before `\begin{document}` is called the *preamble*. It contains commands concerning the setup of the document.

The text of your document is enclosed between the `\begin{document}` and `\end{document}`, within the 'document' *environment*.

Notes

Recap - Environments

Environments enclose text and cause it to be treated a certain way, similar to commands. They usually have a larger scope than a command though. They begin with `\begin{...}` and end with `\end{...}`

```
\begin{document}
   Here is some text
   \begin{center}
       Here is some centred text
   \end{center}
\end{document}
```

Here is some text

Here is some centred text

Notes

Recap - Document Class

The `\documentclass{...}` command tells LaTeX which type of document we are creating, and how it should be set up and formatted. This command usually comes at the very beginning of the file.

As with many commands it has optional parameters, which will change aspects of the structure, formatting or layout.

```
\documentclass[opt1,opt2,...]{class}
```

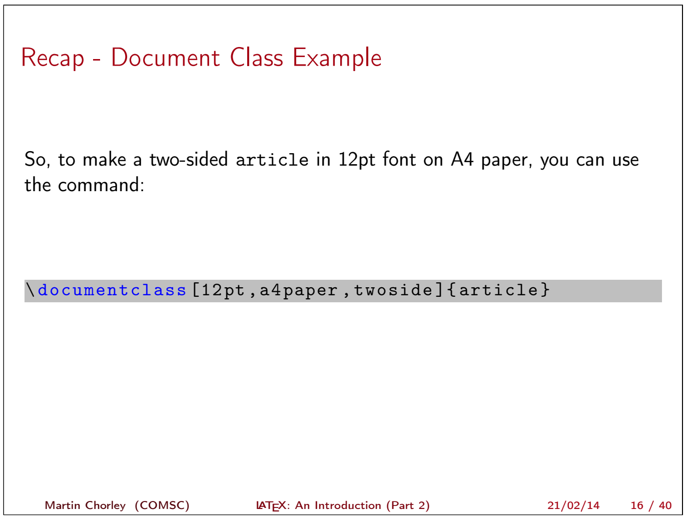
Notes

Recap - Document Class

LaTeX comes with many types of document class built in. Some of the most commonly used are:

`article`	for scientific articles, short reports, papers etc.
`IEEEtran`	for articles in the IEEE Transactions format.
`report`	for longer reports containing chapters, small books, theses.
`books`	for real books
`beamer`	for writing presentations

Notes

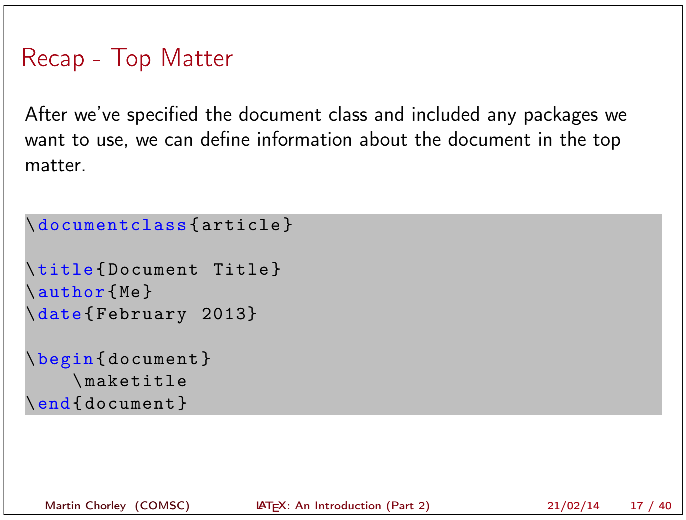


Recap - Document Class Example

So, to make a two-sided `article` in 12pt font on A4 paper, you can use the command:

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

Notes



Recap - Top Matter

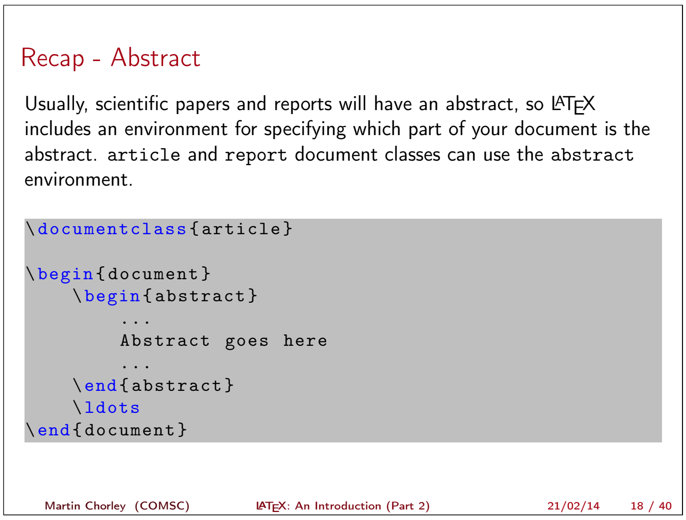
After we've specified the document class and included any packages we want to use, we can define information about the document in the top matter.

```
\documentclass{article}

\title{Document Title}
\author{Me}
\date{February 2013}

\begin{document}
    \maketitle
\end{document}
```

Notes



Recap - Abstract

Usually, scientific papers and reports will have an abstract, so LATEX includes an environment for specifying which part of your document is the abstract. `article` and `report` document classes can use the `abstract` environment.

```
\documentclass{article}

\begin{document}
    \begin{abstract}
        ...
        Abstract goes here
        ...
    \end{abstract}
    \ldots
\end{document}
```

Notes

Recap - Sections & Chapters

We often want to break documents into different parts, chapters or sections.

Command	Level
`\part{part_title}`	-1
`\chapter{chapter_title}`	0
`\section{section_title}`	1
`\subsection{subsection_title}`	2
`\subsubsection{subsubsection_title}`	3
`\paragraph{paragraph_title}`	4
`\subparagraph{subparagraph_title}`	5

Which section commands you can use depends on which document class you are using.

Notes

Recap - Packages

Often,the default set of commands available to LaTeX cannot solve all of our problems alone. To include graphics, use coloured text or other complicated functionality you will need to include extra packages.

These packages will often have extra optional parameters:

```
\usepackage[opt1, opt2, ...]{packagename}
```

So, for example, to use the package allowing us to use coloured text:

```
\usepackage{color}
```

Notes

Recap - Packages

We can include multiple packages in the \usepackage command:

```
\usepackage{color,graphicx,geometry}
```

Any packages where we want to set optional parameters need to use their own \usepackage command:

```
\usepackage{color,graphicx}
\usepackage[margin=2cm]{geometry}
```

Notes

Basic LaTeX Example - Exercise 1

So, we can put all this together, and create a simple LaTeX document.

Notes

Floats

When using a WYSIWYG editor (such as Word), it is common to control *exactly* where pictures or tables are placed in the text. However, many scientific publications allow pictures or tables to go on separate dedicated pages, or at other points in the document in order to not disrupt the flow of the text. LaTeX handles this using *floating environments*.

It can be disconcerting to 'let go' of the control of where items are placed in your document at first, but in general it results in better looking and easier to read documents.

Notes

Floating Tables

In order to make a table 'floating' we wrap the `tabular` environment in a `table` environment. This makes the table float so that LaTeX can place it in the most appropriate location within the document. It also allows us to add a caption and label to our table.

```latex
\begin{table}[ position specifier ]
\centering
\begin{tabular}{|l|}
... your table here ...
\end{tabular}
\caption{This is my table}
\label{tab:mytable}
\end{table}
```

... your table here ...

Table 1 : This is my table

Notes

Position Specifier

The optional position specifier on a floating environment gives a 'hint' to LaTeX as to where you want to place the table. LaTeX will try and honour this position, but it is not guaranteed. The options for location specifier are:

Position Specifier	Location
h	**h**ere - where the table is declared
t	at the **t**op of the page
b	at the **b**ottom of the page
p	on a special **p**age of floats

Note that `h` is automatically replaced by `ht`, as it can cause problems when used alone. You can try and force LaTeX to use a specific position by adding `!` to the specifier.

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Figure environment

The `figure` environment allows us to 'float' our images, much like the `table` environment allows us to 'float' our `tabular` environments.

As a floating environment, it is then possible to label and caption our images.

```
\begin{figure}[placement option]
    ... figure contents ....
\end{figure}
```

Notes

Figure environment

```
\begin{figure}[ht!]
\centering
   \includegraphics[width=0.4\textwidth]{img/background}
   \caption{I have no idea what this is}
\end{figure}
```

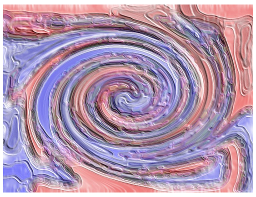


Figure 1 : I have no idea what this is

Notes

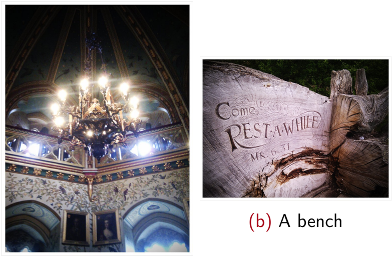
Subfigures

It is often desired to combine multiple images or figures within a single floating environment. For this we can use the `subcaption` package.

```
\usepackage{graphicx}
\usepackage{subcaption}
\begin{figure}[htbp]
    \centering
    \begin{subfigure}{0.3\textwidth}
        \includegraphics[width=\textwidth]{img/lights}
        \caption{Some lights}
    \end{subfigure}
    \begin{subfigure}{0.3\textwidth}
        \includegraphics[width=\textwidth]{img/bench}
        \caption{A bench}
    \end{subfigure}
    \caption{Some lights and a bench}
\end{figure}
```

Notes

Subfigures



(b) A bench

(a) Some lights

Figure 2 : Some lights and a bench

Notes

Subfigures - alignment

We can supply position options to the `subfigure` environment to align the images within a subfigure

```
\usepackage{graphicx}
\usepackage{subcaption}
\begin{figure}[htbp]
    \centering
    \begin{subfigure}[b]{0.3\textwidth}
        \includegraphics[width=\textwidth]{img/lights}
        \caption{Some lights}
    \end{subfigure}
    \begin{subfigure}[b]{0.3\textwidth}
        \includegraphics[width=\textwidth]{img/bench}
        \caption{A bench}
    \end{subfigure}
    \caption{Some lights and a bench}
\end{figure}
```

Notes

Subfigures

(a) Some lights (b) A bench

Figure 3 : Some lights and a bench

Notes

Caption Style

The caption package has many options for customising the appearance of captions

```
\usepackage[font=small, labelfont=bf]{caption}
```

Notes

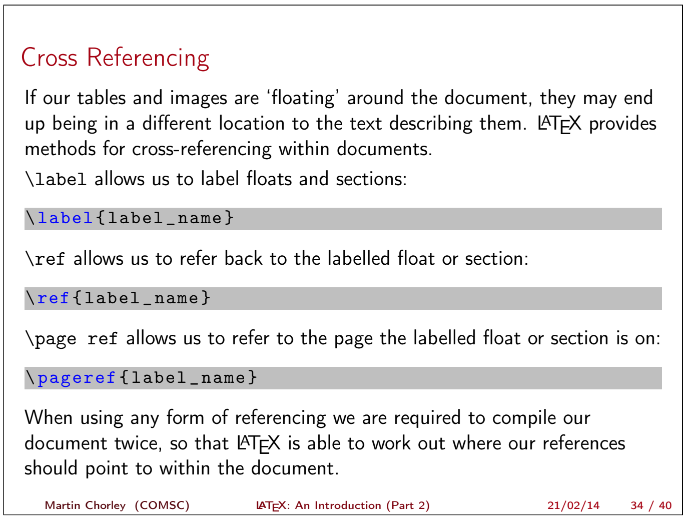
Double Column Floats

When creating a two-column document, it may sometimes be desirable to have your float placed across both columns.

This can be done using the figure* and table* environments, which will place tables or images across both columns of a two-column document.

Note however, this will force the floats to be either at the top of the page, or on a page of their own.

Notes



Cross Referencing

If our tables and images are 'floating' around the document, they may end up being in a different location to the text describing them. LaTeX provides methods for cross-referencing within documents.

`\label` allows us to label floats and sections:

```
\label{label_name}
```

`\ref` allows us to refer back to the labelled float or section:

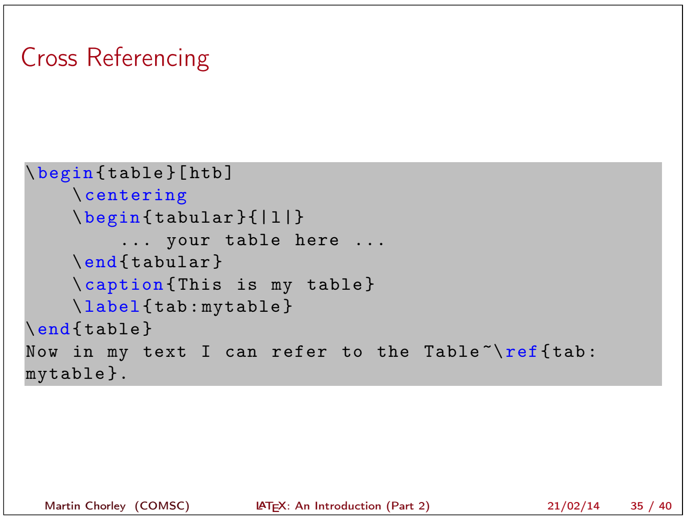
```
\ref{label_name}
```

`\page ref` allows us to refer to the page the labelled float or section is on:

```
\pageref{label_name}
```

When using any form of referencing we are required to compile our document twice, so that LaTeX is able to work out where our references should point to within the document.

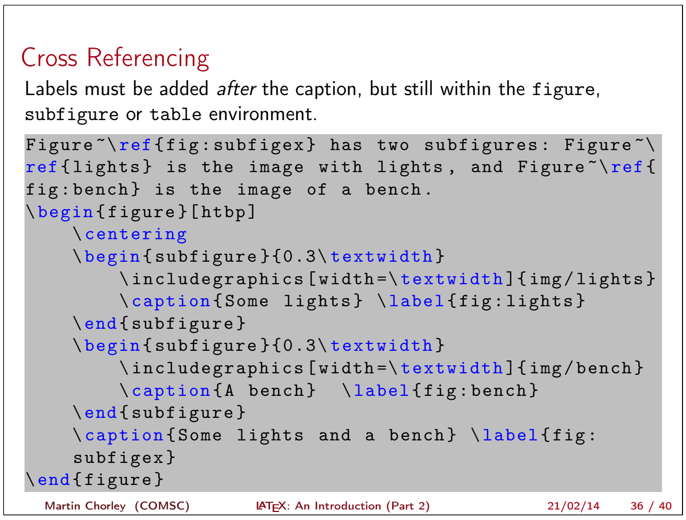
Notes



Cross Referencing

```
\begin{table}[htb]
    \centering
    \begin{tabular}{|l|}
        ... your table here ...
    \end{tabular}
    \caption{This is my table}
    \label{tab:mytable}
\end{table}
Now in my text I can refer to the Table~\ref{tab:
mytable}.
```

Notes



Cross Referencing

Labels must be added *after* the caption, but still within the `figure`, `subfigure` or `table` environment.

```
Figure~\ref{fig:subfigex} has two subfigures: Figure~\
ref{lights} is the image with lights, and Figure~\ref{
fig:bench} is the image of a bench.
\begin{figure}[htbp]
    \centering
    \begin{subfigure}{0.3\textwidth}
        \includegraphics[width=\textwidth]{img/lights}
        \caption{Some lights} \label{fig:lights}
    \end{subfigure}
    \begin{subfigure}{0.3\textwidth}
        \includegraphics[width=\textwidth]{img/bench}
        \caption{A bench}  \label{fig:bench}
    \end{subfigure}
    \caption{Some lights and a bench} \label{fig:
    subfigex}
\end{figure}
```

Notes

Cross Referencing

Figure 4 has two subfigures: Figure 4a is the image with lights, and Figure 4b is the image of a bench.

(b) A bench

(a) Some lights

Figure 4 : Some lights and a bench

Notes

Exercise 2

Experiment with adding images into your documents.

Add captions and labels, and refer to them within your text.

Experiment with layout and positioning.

Notes

Help?

There are *many*, *many* places to get more help with LaTeX.

If you have a problem, use Google! Often that will lead you straight to the documentation for the package or command you have a problem with.

Otherwise, StackExchange has a thriving TeX community where you can ask for help and advice:

`http://tex.stackexchange.com`

Notes

Help?

All the LaTeX code for the slides and exercises today is available online:

`https://github.com/martinjc/LaTeX-an-Introduction-Part-2-`

or

`http://martinjc.com`

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