Using LaTeX in reports at Grattan

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Contents

Interpreting code examples

Example code are written using a listing:

```
LaTeX code with some \markup.
\begin{environment}

\end{environment}
```

or inline: `\TeX{}`.

Code examples can be, for want of better terms, *complete* or *illustrative*. **Complete** code means the code should be copied-and-pasted directly into the input file without modification, whereas **illustrative** code should be modified based on the desired output. For example, if an author wishes to increase the gap between columns in the overview by 2 mm, the code excerpt below is complete. The author should copy and paste the following, placing it before `\begin{overview}`:

```
\newlength{\overviewextra}
\setlength{\overviewextra}{2mm}
\addtolength{\columnsep}{\overviewextra}
```

Whereas in an illustrative version of the above, the author is offered a choice for the gap between columns. In illustrative code examples, such options are coloured violet, slanted, and delimited with chevrons:

```
\newlength{\overviewextra}
\setlength{\overviewextra}{<extra column width>}
\addtolength{\columnsep}{\overviewextra}
```

Text coloured blue is simply syntax highlighting and has no special meaning. All TeX documents are written in plain text (although your text editor/IDE may offer or display similar syntax highlighting).

1 Some principles for erstwhile MS Word users

Learning LaTeX as an MS Word user is a frustrating, confusing, rewarding, and ecstatic experience. There are some principles that are inviolate for novices.

1. Don't worry about the appearance of your document as your write. Write what you mean. MS Word is a What You See Is What You Get editor. LaTeX is a What You See Is What You *Mean*.

2. LaTeX takes an author's input and sets out the document's appearance using the author's raw input, the author's advice about how the document should look, and a set of parameters and algorithms that govern tradeoffs concerning document appearance.

3. The `grattan.cls` template is designed so that authors do not have to make any layout or typographic decisions.

4. LaTeX is a butler, not a robot. It may not do exactly as you say, but it will do what you mean. When it doesn't, it either means
   - You given it a nonsensical instruction
   - Your instruction contradicts another instruction
   - Your instruction contravenes good typographic design, as it sees fit

5. LaTeX is a butler, not a slave: it is a partner in document preparation. In general, your responsibilities should not overlap: you decide the content and it decides the form. Where your responsibilities do overlap, you should seek to *advise* LaTeX, not to *order* it. Further, you should be as gentle as possible with your advice. Only forcefully advise when the document will not require amendments and you are sure LaTeX is wrong.

6. LaTeX is a computer program, not a human. Despite the previous points, there are limits to what LaTeX can do. In particular, LaTeX cannot reword paragraphs.

7. Don't manually position figures, tables, or boxes. Let them float in the document. It is nearly certain that the initial placement will be odd. As long you have used a `figure`, `table` or `*box` environment, they will float into good positions. For errant figures, tables, or boxes, wait until the document is completely finished before advising positions.

8. Don't do any of the following:
   a) Insert horizontal or vertical whitespace, including manual line-breaks (except in tables)
   b) page- or column-breaking

9. Do not ignore errors (*i.e.* things that prevent compilation). Any errors which you can't resolve in less than 60 seconds should be referred to Cameron Chisholm or Hugh Parsonage. Preferably attach what you think caused the error.

10. Take note of warnings from time to time. Warnings relating to bibliographies should be fixed immediately. Other warnings are typically just hints that manual intervention may improve the layout – resolving them can be deferred.

11. Beware special characters.

When you want this …	… type this.
$	\$
%	\%
"	`` (button above `Tab`)
"	''
– (en-dash)	--
— (em-dash)	---
−	\(-\)

12. The grattan class file assumes your input is encoded in `UTF-8`. Avoid copying from MS Word to `.tex` files. Otherwise, special characters above will creep in silently. If you must, use `pandoc`.

13. Use `%` for comments.

2 Basics of LaTeX

2.1 Compilation

The process of LaTeX is basically:

1. Start with a plain text file with the file extension `.tex` in a directory/folder

2. Run the `pdflatex` program on that file. That is, type

   ```
   cd path/to/your/directory
   ```

   and then

   ```
   pdflatex myfile.tex
   ```

   in cmd (Windows) or Terminal (Linux or Mac).

3. The program puts a pdf file `myfile.pdf` or returns an error.

2.2 Commands and environments

2.2.1 Commands

A **command** starts with a backslash \ followed by one or more characters. A command may have zero or more mandatory arguments and zero or more optional arguments. For example:

Table 1: Examples of commands and their arguments

Command	Arguments	Description
\$	0 mandatory 0 optional	Prints the $ sign
\textbf	1 mandatory 0 optional	Prints its argument in boldface.
\\	0 mandatory 1 optional	Forces a line break, with optional extra space
\footcite	1 mandatory 2 optional	Cites its mandatory argument, with optional pre- or post-notes (such as page numbers)
\footcites	n mandatory $2n + 2$ optional	Multiple footcites

2.2.2 Environments

An **environment** looks like

```
\begin{environment}
  ...
\end{environment}
```

It may have mandatory or optional arguments, which occur immediately after \begin{environment}.

Table 2: Examples of environments

Environment	Arguments	Description
document	none	The contents of the document.
figure	1 optional	Creates a section of a document which "floats" above the body of the text. Captions and cross-reference labels within a figure environment will refer to the figure. The optional argument restricts the placement of the figure on the page.
quote	none	Used to designate a long quote with additional margin.
smallbox	2 mandatory, 1 optional	Creates a box, limited to one column. The first argument is optional and specifies the position of the box. The second argument is mandatory and specifies the title of the box, the third argument is also mandatory and specifies the cross-reference label of the box.

3 Writing a report

3.1 The preamble

The **preamble** is everything outside the document environment. (*i.e.* everything after \begin{document}.

In every LaTeX document, you must have

1. The *command* \documentclass and a valid document class. In our case, use

   ```
   \documentclass{grattan}
   ```

2. A document environment.

That is, every LaTeX document must have the following three lines.

```
\documentclass{<style>}

\begin{document}

\end{document}
```

3.1.1 Grattan-specific preamble

The grattan package will not compile without additional lines of code. Your preamble must have the following lines.

```
\documentclass{grattan}

\title{<Title of the report>}
\author{<Authors>}

\GrattanReportNumber{<number>} %% or
    \GrattanWorkingPaperNumber

\addbibresource{bibliography.bib}
```

3.1.2 Other requirements

The .tex file must be in a directory containing:

1. The grattan.cls file, which creates the document according to the Grattan template.

2. The bibliography.bib file, containing your bibliography database.

3. The folder FrontPage which must contain:

a) A file `FrontPagePicture`

4. The following files:

```
aus-gov-logo-stacked-black.pdf
Bhp.pdf
GrattanSVGLogo.pdf
TMF_logo_green-eps-converted-to.pdf
TMF_logo_green.pdf
UOM-Pos_S_PMS.pdf
Vic_Gov_Logo-2016.pdf
```

3.2 Frontmatter

3.2.1 Overview / Summary / Preface

Use

```
\begin{overview}[-35pt]
 ...
\end{overview}
```

for your overview. The `[-35pt]` is a fudge factor that adjusts the position of the title to vertically balance the overview on the page. It may be abolished in future versions.

You can also use `\begin{summary}` as required. If you want to change the name of the frontmatter, ask us — it is straight-forward to amend.

3.2.2 Contents page(s)

Write

```
\contentspage
```

After the `overview` environment. This produces a list of figures and a list of boxes. If you don't want some of these lists, again, ask us — it is straight-forward to omit, but it is a matter for the class file maintainer.

3.3 Body text

3.3.1 Sectioning

To start a new chapter, write

```
\chapter{<chapter title>}
```

Similarly,

```
\section{<section title>}
\subsection{<subsection title>}
\subsubsection{<subsubsection title>}
```

Title commands increment as expected, except for `\subsubsection` which has no counter.

To start an appendix, type `\appendix`.

```
\appendix
```

to mark the end of the main matter and the start of the appendices. Then use `\chapter{<appendix title>}` to title the appendices.

For example:

```
\documentclass{grattan}

\title{Brief report}
\author{Me}

\begin{document}

\begin{overview}
In this report, we found all is well.
\end{overview}
\contentspage
\chapter{Australia is fine}
Australia is fine.
\section{How do we know this}
Grattan analysis of ABS (2016).
\subsection{Limitations of analysis}
Our analysis is wrong.

\chapter{Options for reform}
Tidy desk.
\appendix
\chapter{International comparisons}
\end{document}
```

3.4 Boldface, italics

In general, you should write what you *mean*, not what you want displayed. So avoid directly instructing LaTeX to bold or italicize test. Instead, write macros explaining *why* you are using a different font.

That said, you can use `\textbf{<text>}` to make *text* boldface and `\textit{<text>}` to make *<text>* italic. You can also use `\emph` to *emphasize* text.

3.5 Paragraphs

Use a blank line to mark a new paragraph. Thus

```
A well-designed GST reform package could support economic
    growth, make the tax and transfer system more progressive
    and give state and Commonwealth governments more budgetary
    options.

Proposals to extend or broaden Australia's 10 per cent goods
    and services tax (GST) have been perennial. Current
    governments face many challenges, such as funding growing
    healthcare costs, reducing deficits, and cutting
    inefficient taxes. A higher GST could fund any of these
    initiatives -- although perhaps not all of them.
```

3.5.1 Non-breaking spaces

Use $\sim$ for a non-breaking space: \$40~million.
Use `\nobreakdash-` for a non-breaking hyphen: 2013\nobreakdash-14.

3.6 Numbered / bulleted lists

Use enumerate and itemize

```
\begin{enumerate}
 \item First numbered item
 \item Second numbered item
 \begin{enumerate}
  \item First item in a nested list
 \end{enumerate}
 \item Third numbered item
\end{enumerate}

\begin{itemize}
  \item First bulleted item
  \item Second bulleted item
  \begin{itemize}
   \item First nested bulleted item.
  \end{itemize}
\end{itemize}
```

3.7 Floats

3.7.1 Figures

Before you insert a figure, you need to create your image. This can either be done directly through a scripting language (like R or python), through LaTeX directly (as through Ti*k*Z), or through an external program. Your file should be a pdf, though almost all image types are supported. If you are going through an external program, ensure the file is moved to the atlas directory of your report. This directory should be placed in the same directory as your `.tex` file. The directory should be called something evocative, like `figure`, as it is in this manual.

Once the image is ready, use the following structure to insert a figure.

```
\begin{figure}
\caption{<main caption>\label{<cross-reference key>}}%
\units{<secondary caption/y-axis label>}
\includegraphics{figure/image-filename}
\noteswithsource{<Notes of the chart>}%
{<Source information>}
\end{figure}
```

3.7.2 Tables

Tables are tricky in LaTeX. Use the `tabularx` environment for a table with a specific width. Let `\columnwidth` be the table's width.

```
\begin{tabularx}{\columnwidth}{<alignment parameters>}
\toprule
Header1 & Header2 & Header3 \\
\midrule
First row & First row & First row \\
Second row & Second row & Second row \\
...
Last row & Last row & Last row
\bottomrule
\end{tabularx}
```

The `<alignment parameters>` determine the alignment of the columns, `l` for left-aligned, `c` for centre-aligned, `r` for right-aligned. Others are available. Use the double-backslash `\\` to move to the next row and the ampersand `&` to move to the next column. Use `\toprule` before the first row, `\bottomrule` after the last row, and `\midrule` to separate the headers from the rest of the table.

More advanced

\cmidrule(lr){<m-n>}	to denote a horizontal rule between the mth and nth columns. The (lr) specifies that the horizontal rule should stop just short of the edges of the columns, to ensure adjacent \cmidrules have a visual breath between them.
\multicolumn{<n>}{<al.>}{<text>}	Puts the <text> in a 'merged' cell from the current cell across <n> columns with horizontal alignment <al.>

```
\newcommand{\tblHead}[2][c]{\bfseries\begin{tabular}[#1]{@{}l@
    {}}#2\end{tabular}}
\newcommand{\tblHeadR}[2][c]{\bfseries\begin{tabular}[#1]{@{}>{
    \raggedleft}p{\linewidth}@{}}#2\end{tabular}}

\begin{table}
  \caption{Budgetary impact of income tax rate changes}\label{tbl:
      tax_cuts}
  \begin{tabularx}{\columnwidth}{lr>{\raggedleft\arraybackslash}X
      }
    \toprule
    \tblHead{Tax bracket} & \tblHead{Current tax rate} &
        \tblHeadR{Budgetary impact of 1 percentage point change
        (2015-16)}\\
    \midrule
    \$0-\$18,200        & 0\%   & \\
    \$18,201 - \$37,000 & 19\% & \$1.9\\
    \$37,001 - \$80,000 & 32.5\% & \$2.3\\
    \$80,001 - \$180,000 & 37\% & \$1.3\\
    \$180,001 +         & 45\%  & \$0.7\\
    \bottomrule
  \end{tabularx}

  \noteswithsource{Excludes Temporary Budget Repair Levy (2\%\
      for those earning over \$180,000 until 2016-17)}%
  {Grattan analysis ATO 2\%\ sample file (2013). See \url{https
      ://grattan.shinyapps.io/Changing_income_taxes/Forty_three_
      app.Rmd}}
\end{table}
```

3.8 Boxes

3.8.1 smallbox

Use \begin{smallbox} to insert a box intended to fit on one column. There are two mandatory arguments.

```
\begin{smallbox}{<title of the box>}{box:<cross-ref key>}
 <contents of the box>
\end{smallbox}
```

3.8.2 verysmallbox

The very small box is used for boxes which may be sufficiently shorter than a column to share the column with paragraphs from the body text. Such boxes would contain two or fewer paragraphs.

3.8.3 bigbox*

Use \begin{bigbox*} to denote a big box.[1] The text will flow around the box.

Figures in boxes must use [H]

When you have a figure in a big box, you must use

```
\begin{figure}[H]
 ...
\end{figure}
```

to insert a figure.

Note the [H] which specifies that the figure is to be placed here (or rather, *HERE!*).

3.9 Footnotes in boxes

Insert footnotes (and \footcites) as if they were part of the main body text. The footnotemarks will be letters, not numbers, and the footnote area will be within the box.

3.10 Cross-references

There are three commands used in cross-referencing: \label, Vref and Cref. The first designates the target of a cross-reference; the other two are for making a cross-reference to such a target.

For example, to refer to some figure, use the following template.

---

[1]The * reflects a convention in LATEX for a two-column float in an environment name.

```
Some text which is illustrated by a chart (\Vref{fig:key})

\begin{figure}
  \caption{The chart's caption\label{fig:key}}
  \includegraphics{thechartfilename.pdf}
\end{figure}
```

Your labels should be evocative of what is displayed, not the number. You will end up moving or removing a figure, table, or box and confuse your labels.

If you refer to a cross-reference that doesn't exist, the pdf will contain a bold ??.

The contents of `\label` can be anything containing letters, underscores, or hyphens. I *strongly* recommend you use the prefixes in Table 3. Using these prefixes consistently will make auto-completion easier.

Table 3: Prefixes to use in cross-reference anchors, by float type

Float environ.	Prefix	Example
figure	fig:	\label{fig:prop-hholds-by-decile}
table	tbl:	\label{tbl:tax-paid-by-bracket}
box	box:	\begin{smallbox}{A short history of motorsport}{box:motorsport}

3.11 Footnotes and referencing

Use the command `\footnote` to mark a footnote. Use `\textcite` within a footnote.

3.11.1 `bibliography.bib`

The `bibliography.bib` file is a plain text containing the bibliography databases. The database contains several lines for each entry:

```
@type{<key>,
  author={<author name>},
  title={<title>},
  year={<year>}
}
```

There are several elements to a bibliography:

@type This specifies the type of reference, such as an article, report, book.

<key> This is a string of text or numbers (no spaces or special characters) which represent the *key* which is referenced in the text (as I will show below).

author=<author name> each of these lines designate the fields of the reference

3.11.2 Citations

Use `\footcite{`*`<key>`*`}` to cite an entry in the database if you want the citation to appear in a footnote. Use `\footcites{`*`<key1>`*`}{`*`<key2>`*`}` to cite multiple entries in the same footnote.

Use `\footcite[][18--24]{`*`<key>`*`}` to add a page reference (in this case, pages 18–24) as a postnote the citation. Use `\footcites{key1}[][44]{key2}` to cite key1 and page 44 from key2.

Use `\textcite{<key>}` to cite a reference if the reference should not be footnoted. Similarly `\textcites` and `\textcite[][18--24]{key}` as with footcite.

4 More advanced macros

4.1 New commands

Use `\newcommand` to create a new command.

```
\newcommand{<command name>}{<what the command does>}
\newcommand{<command name>}[<number of arguments>]{<what the
    command does as a function of #>}
```

For example,

```
\newcommand{\eg}{\emph{e.g.}}
```

Creates a new command \eg which prints *e.g.* when it is called. Another one I often use is:

```
\newcommand{\gao}{Grattan analysis of}
```

Slightly more advanced is

```
\newcommand{\defi}[1]{\textbf{#1}\index{#1}}
```

This makes the argument of \defi bold and places it in the index.

5 Compiling a final document

5.1 Citations and references

1. If your file is called `YourReport.tex`

   ```
   texify --pdf --clean YourReport.tex
   ```

2. Update bibliography

   ```
   biber YourReport
   ```

   Note that you should not provide the extension for `biber`.

3. Re-run:

   ```
   texify --pdf --clean YourReport.tex
   ```

6 Common mistakes made by novices

1. Not regularly compiling your document.

2. Not fixing errors revealed through compilation.

3. Not checking citations have been correctly rendered:
   a) Making sure you've hit the right reference.
   b) Making sure the references have been entered correctly.

4. Using `Figure \Vref` instead of just `\Vref`.

5. Putting `\label` in the wrong position. (It should be immediately after the counter is updated.)

6. Manually specifying figure position, column breaks, white space.

7. Using `\footcite` instead of `\textcite`:
   a) In notes and sources or
   b) In footnotes themselves.

8. Using `\textcite{blah}` and `\textcite{foo}` instead of `\textcites{blah}{foo}`.

7 Known bugs in the `grattan.cls` file

7.1 `microtype`'s spacing and `ragged2e`

Currently, `spacing=true` and `ragged2e` are used. This is not supported by `microtype`, which issues a warning. Indeed, it can cause catastrophically bad typesetting.

If you see words being put on top of other words, it is due to this bug.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam urtia tincidunt. Vestibullam corper turpis. Pellentesque cursus luctus mauris.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lacus. Sed nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

The fix depends on the context: if it occurs within an environment EE, use `\AtBeginEnvironment{EE}{\RaggedRight}`. If it occurs close to a list, a paragraph break (*i.e.* a blank line) before the list environment may be necessary.

7.2 Big boxes

7.2.1 Caption baseline does not match matching column baseline

Solved: http://tex.stackexchange.com/questions/305450/align-caption-baseline-in-second-colum

7.3 Footnotes in big boxes extend across the entire page

8   pdflink errors

Use `\nocite`{*} and delete all auxiliary files to escape the error.

Part I.
Notes for the typesetter

9 Moving floats

1. If the author would prefer a float (figure, table, or box) to be placed in a different location in the document, you as the typesetter must first understand why the output routine has placed the figure where it has.

2. If it is clear that the output routine has averted a substantial typographic sin by placing the figure there, the author should be told of this.

3. Otherwise, the first step is to move the errant float forward or backward one or two paragraphs as required, noting that the order in which floats of the same type (*e.g.* figure) occur in the source file is preserved in the final document.

4. Next consider, in the following order:

   a) providing the options [htb] as required to the float environment

   b) providing the same options to the errant float's predecessor

   c) providing the same options to both the errant float and its predecessor

5. At this point, if the figure remains steadfast, you have encountered a very unusual situation, and I would encourage you to accept the result.

6. Otherwise: you should consider rewording captions or the surrounding text.

7. Next consider the use of \FloatBarrier

8. Then consider the option !.

9. As an emergency measure, you can manually place the figure using the option H.

10. As a last resort, consider using primitive TeX to manually place the figure with respect to the page. This should be the very last step in a publication.

10 Bad page break

Consider using:

1. `\pagebreak[1]` at a good/better place for line breaking:

2. `\enlargethispage{<n>\baselineskip}` or `\enlargethispage*{<n>\baselineskip}` where `<n>` is an integer multiple of $1/4$.

11 Excessive whitespace between paragraphs

This occurs when there is insufficient text to fill a page (the page is *underfull*) but moving text onto another page is not possible because:

- A section would be orphaned from its title

- A footnote would have to be set on a different page from its mark.

1. Reposition floats if useful.

2. Use \oneraggedpage:

```
% one page ragged bottom
\makeatletter
\newcommand{\oneraggedpage}{\let\mytextbottom\@textbottom
  \let\mytexttop\@texttop
  \raggedbottom
  \afterpage{%
  \global\let\@textbottom\mytextbottom
  \global\let\@texttop\mytexttop}}
```

3. Finally, use \raggedbottom on the entire document. Review.

12 Hyphenation

Hyphenation can be distracting and interrupt the text; however, the alternative to hyphenation is often worse.

When the text is typeset ragged right, LaTeX will actually be *more* inclined to hyphenate. If full-width justification on a paragraph can be used, it will minimize discretionary hyphens.

LaTeX will, by default, avoid hyphenating words, and desperately try to avoid putting discretionary hyphens on consecutive lines or at a page break.

If a paragraph in your report contains unsightly hyphenation (*i.e.* consecutive hyphens or hyphenation across pages), the best and perhaps only solution is to reword the paragraph.

There is one exception. The command

```
\setlength{\overviewExtra}{1mm}
```

will add 1 mm extra to the nominal column width in the overview. Try values from −4 mm to 4 mm to minimize hyphenations.

In the unlikely event that rewording the paragraph does not change the hyphenation, you can increase `\emergencystretch` to `0.5em`. Note that you in doing so are take responsibility for the typesetting of that paragraph. You may wish to play around with penalties, but you should do so with trepidation and only ever locally.

Never use `\raggedright` in ordinary body text. It is acceptable in text where each "paragraph" is really an isolated verse or element. For example, it is acceptable in a list of recommendations, in a table, or in the captions to figures. Although in deploying `\raggedright` you win certainly the battle regarding excessive hyphenation, you lose the war – the text can become badly ragged – and paragraphs will need to be reworded.

Part II.
Error messages

Common LaTeX Errors

This chapter is best understood by following the PDF output.

The following is a list of common LaTeX compile errors as they appear in the log file, and suggestions for how to resolve these. More often than not, errors come from something simple, such as forgetting a parenthesis, a typo, or forgetting to end an environment. But there are also cases where you have no idea what you have done wrong and it can take a fair bit of time to find or even understand your error.

A feature of ShareLaTeX is that it provides 'hints' on how to resolve particular errors – most of the time these hints are sufficient. But if not, it may be necessary to view the raw log file to diagnose the problem.

A The Form of an Error

There are two forms of errors: LaTeX errors and TeX errors. In both types of errors, the part after the error message will tell you where the error occurred. An example:

```
l.15 <offending text>
```

The `l.15` tells you what line the error occurred on and the text will tell you the text that caused the error.

A.1 LaTeX Errors

The general form of an error in LaTeX is shown below:

```
! LaTeX error: <error message>

See the LaTeX manual or LaTeX Companion for
explanation.
Type H <return>   for immediate help.
...
```

The `!` lets you know that the error has occurred. The error message will tell you what type of error you have committed. After the ellipses, you will find the line at which the error occurred and the text that caused the error (or at least the text where LaTeX found the error).

A.2 TeX Errors

Errors may also have the following form:

```
! <error message>
```

These errors are formatted differently because they are error messages that came from TeX instead of LaTeX. After the error, you will still find the line that the error occurred in and the text of the error.

B Warnings

There are some error messages that are just warnings and will not stop or change the compilation of the document. Chances are you have seen them many times.

B.1 Underfull

The following error results when a line does not extend the width of the page, something LaTeX always tries to accomplish:

```
Underfull \hbox (badness 10000) in paragraph at lines
104--107
```

This error message is just a warning and is not something to worry about. For the most part, when a line does not span the width of the page, it is because you have written something that you want to only cover part of the page.

B.2 Overfull

The following error results when a line extends beyond the width of the page:

```
Overfull \hbox (16.04988pt too wide) in paragraph at
lines 30--31 [] [] \OT1/cmtt/m/n/12 I'm trying to put
way too much text into a line in my document.
```

Usually this error comes form when you are using the verbatim package because it will not move to the next line if your text does not go to the next line. The easiest way to fix this is to find the place in your document where this is occurring and change the text so that it fits to the page.

This error will still show up if the text is still on the page but outside of the width of text that LaTeX has set. In this case, you are welcome to fix things so that the error does not show up or you can leave the text as it is.

B.3 References

The following warnings occur when references are changed when LaTeX was compiled:

```
LaTeX Warning: Label(s) may have changed. Rerun to get
cross-references right.
```

```
LaTeX Warning: There were undefined references.
```

```
LaTeX Warning: Reference `name' on page 1 undefined on
input line 15.
```

The way to fix these errors is to recompile the document again to correct the page numbers. Sometimes it is necessary to recompile the document twice to fix this error. You also may have defined a reference wrong, so you should check to make sure your label is correct.

C Beginning and Ending

C.1 Begin Ended by End

This type of error occurs when each environment is not correctly started and ended. When you are missing an \end command, the following error will show up:

```
! LaTeX Error: \begin{enumerate} on input line 23
ended by \end{document}.
```

To fix this, you need to end the environment mentioned in the error with the appropriate command.

When you are missing a \begin command, the following will appear:

```
! LaTeX Error: \begin{document} ended by
\end{itemize}.
```

To fix this, you basically do the same thing as before, correctly beginning the environment mentioned in the error with the appropriate command.

C.2 End Occurred Inside a Group

The following error message will show up at the end of compiling a file if an environment is begun that is not ended:

```
(\end occurred inside a group at level <n>)
```

To fix this error, make sure you end the environment that was begun. The previous error is more helpful in finding the \begin statement.

C.3 Ended by End of Line

The following error will occur when you try to place a command inside a section heading:

```
! LaTeX Error: \verb ended by end of line.

See the LaTeX manual or LaTeX Companion for
explanation.
Type H <return>  for immediate help.
...
```

There will be many errors of the same type for this mistake. In order to find where you put the command, look in the output file and find the last heading that shows up.

C.4 Missing Begin Document

This error is self-explanatory:

```
! LaTeX Error: Missing \begin{document}
```

D Errors Usually Caused by Bad Spelling

D.1 Unknown Control Sequence

This error results when you use a command (something that starts with a \) that is not recognized by LaTeX:

```
! Undefined control sequence.
```

Usually this error results from spelling a command incorrectly. Go to the line that is indicated by the error and fix the command.

D.2 Environment Undefined

This error results when you begin an environment with a \begin command that is not recognized:

```
! LaTeX Error: Environment verbatin undefined.
```

Usually you have just spelled your environment incorrectly, so you just need to fix it.

D.3 Bad File Name

This error results when you have mistyped the command latex or do not have LaTeX installed on your computer:

```
Bad command or file name
```

To fix this, correctly spell the command to compile your file or make sure that LaTeX is correctly installed on your computer.

D.4 Cannot Find File Name

This error occurs when you try to compile a file that the computer cannot find:

```
! I can't find file `sample'.
<*> sample

Please type another input file name:
```

To fix this error, make sure you have spelled the file name correctly. You also may be in the wrong directory to compile the file, so check to make sure you are in the same directory as your file.

E Fatal Errors

E.1 Runaway Argument

This error happens when a paragraph ends before a command's argument is done (i.e., LaTeX thinks that there is a missing }):

```
Runaway argument?
```

To fix this, you should use a different command to accomplish what you are trying to do. An example of this is to use `\bfseries` instead of `\bftext` to make bold text in more than one paragraph.

This error can also be caused by a missing mandatory argument to a command.

E.2 Just an *

This error normally occurs when you do not end your document with `\end{document}`:

```
*
```

If you are prompted to enter something in, it is best to enter

```
\end{document}
```

and hope it works. Be sure to end your document with the appropriate command.

E.3 Emergency Stop

This error happens when LaTeX will stop trying to compile your document due to a serious error:

```
! Emergency stop.
```

To fix this error, you will need to figure out what caused it to stop compiling. Chance are you forgot to end your document with `\end{document}`, but there might also be another reason for the emergency stop.

E.4 Please Type a Command or Say End

This error happens when your file has ended prematurely:

```
(Please type a command or say `\end')
```

The best way to deal with this type of error is to type

```
\end
```

or

```
\end{document}
```

in the case that the absence of that command caused the error. Usually if you have ended your document correctly, the error will result from a missing } or forgetting to end a verbatim environment.

F Graphics Errors

F.1 Too Many Unprocessed Floats

This error occurs when figures or tables (i.e., floats) have not been typeset:

```
! LaTeX Error: Too many unprocessed floats.
```

LaTeX can only have so many floats waiting to be typeset. In order to fix this error, make sure that you are placing your floats where you want them (with a `[h]` option) and not wanting too many on one page in sequence. Using the command `\clearpage` can be very useful in distributing floats correctly.

F.2 Unknown Graphics Extension

The following error occurs when you try to use a type of graphic that is not supported by the type of file that you are producing:

```
! LaTeX Error: Unknown graphics extension: .gif
```

In order to fix this error, you should change your graphics to the types that are supported by the type of file you are outputting or you will need to include the correct package to deal with that type of graphic. Sometimes you may have named the graphic poorly so that LaTeX will not recognize it as a graphic file.

F.3 Division by Zero

The following error occurs when the height of a graphic object is zero:

```
! Package graphics Error: Division by 0.
```

This is usually caused when you rotate an object with zero depth so that its height becomes zero. The best way to fix this is to use the keyword `totalheight` instead of `height`.

G Math Errors

G.1 Display Math Should End With $$

This error occurs when the displaymath or equation mode is ended incorrectly:

```
! Display math should end with $$
```

To fix this error, make sure that you end the displaymath or equation mode correctly (ending them with a $ is not acceptable).

G.2 Bad Math Environment Delimiter

This error occurs when you do not have your delimiters correct in math mode:

```
! LaTeX Error: Bad math environment delimiter.
```

Usually this occurs when you forget to match a right delimiter with every left delimiter. This error may also happen when you forget to end an array.

G.3 Missing Right

This error occurs when you have a missing right parenthesis:

```
! Extra \right.
```

To fix this, you either need to add a \right command or you need to end an array.

G.4 Missing Delimiter

This error message occurs when a delimiter is missing:

```
! Missing delimiter (. inserted).
```

To fix this error, you need to make sure that you have a right delimiter for every left delimiter. If you do not want a right delimiter matching a left delimiter, you need to use "." to not have an error message show up.

G.5 Missing $ Inserted

The following error occurs when you try to use a character that can only be used in math mode, like _ or ^:

```
! Missing $ inserted
```

To fix this error, make sure you change the character to what it should be in text mode.

H Tabular Environment Errors

H.1 Misplaced Alignment Tab Character &

This error occurs when you use & and when you are not in a tabular environment:

```
Misplaced alignment tab character &
```

To fix this error, you need to use \& to make a &.

H.2 Extra Alignment Tab

This error occurs when you use too many tabs for the number of columns in a table:

```
! Extra alignment tab has been changed to \cr
```

The result of this error is that a new row is formed where the extra tab was. You should go back and fix your table so that the correct number of items in each row would show up.

H.3 Argument Has an Extra }

These errors happen when an incorrect number of arguments to a tabular environment have been specified:

```
! Argument of \cline has an extra }.
```

```
! Argument of \multicolumn has an extra }.
```

To fix this error, make sure your arguments to the tabular environment are correct.

1 Errors With Lists

1.1 Missing Item

This error occurs when there is plain text in an environment that takes items:

```
! LaTeX Error: Something's wrong--perhaps a missing
\item.
```

To fix this error, make sure the plain text is changed into an item.

1.2 Too Deeply Nested

This error occurs when there are too many lists for LaTeX to handle:

```
! LaTeX Error: Too deeply nested
```

LaTeX can only handle four levels of one type of list and six levels of different types of lists. To fix this, you need to use less levels of lists or define your own list environment.

J Miscellaneous Errors

J.1 Only Used in the Preamble

This error occurs when you place a command in the body of a LaTeX document that should be placed in the preamble:

```
! LaTeX Error: Can be used only in the preamble.
```

To fix this error, just move the command to the preamble.

J.2 There Is No Line/Page Here to End

This error occurs when you incorrectly use the commands that make a new line or a new page:

```
! LaTeX Error: There's a no line here to end.
```

You may just leave the command that is making a new line in place or you can take it out. Here, LaTeX is just trying to make sure that everything looks nice.

J.3 Command Already Defined

This error occurs when you try to define a command that already exists:

```
! LaTeX Error: Command ... already defined.
```

To fix this, you need to define your command differently.

J.4 Missing Number

This error is made when a number is expected as an argument and one is not provided:

```
! Missing number, treated as zero.
```

To fix this error, you need to find where a number is expected so that you can provide the correct one.

Table 4: List of all commands

\Command	Comment	Group
\boxsources	Source matter within boxes	Boxes
\citetitle	Inserts the title of a citation, as well as including the reference in the bibliography.	Citations & bibliography
\footcite	Citation to be placed in a footnote	Citations & bibliography
\footcites	Multiple citations to be placed in a footnote	Citations & bibliography
\footnote	Insert a footnote.	Citations & bibliography
\textcite	Inline citation	Citations & bibliography
\textcites	Multiple citations to be placed inline	Citations & bibliography
\Vref	Initial cross-reference (to a \label)	Cross-referencing
\Cref	Subsequent cross-reference (to a \label)	Cross-referencing
\label	The target of a cross-reference.	Cross-referencing
\phantomsection	If the target of a cross-reference is not a figure, table, or section (*i.e.* it is just text in a paragraph), use \phantomsection\label<key> to anchor the cross-reference	Cross-referencing
\bottomrule	Final horizontal rule in a table	Figures and tables
\caption	General caption (grey, bold)	Figures and tables
\captionwithunits	Caption with first argument top line and second argument units for chart	Figures and tables
\cmidrule	Horizontal rule over a subset of columns	Figures and tables
\columnwidth	Supplies the current width of the column	Figures and tables
\includegraphics	inserts an image (typically a pdf) using the file provided	Figures and tables
\linewidth	Current width of line	Figures and tables
\midrule	Horizontal rule separating heading from contents in a table	Figures and tables
\multicolumn	Spread a cell over multiple columns (merge cells)	Figures and tables
\notes	Puts notes under a chart	Figures and tables
\source	Puts source text under a chart	Figures and tables
\noteswithsource	Puts notes and source under a chart/table	Figures and tables
\toprule	First horizontal rule in a table	Figures and tables
\units	Units for charts	Figures and tables
\emph	Emphasize text with an oblique font	Fonts
\textbf	Boldface	Fonts
\textit	Italic font (oblique font for Arial)	Fonts
\item	Commence new number or bullet in an enumerate or itemize environment	Lists
\ie	Macro for consistent use of 'i.e.'	Misc
\input	Used to insert raw .tex code from another file	Misc
\addchap	Chapter without number	Sections
\chapter	Begins a new chapter, first argument the title of the chapter	Sections
\section	Section title	Sections
\subsection	Subsection title	Sections
\addbibresource	The path of the bibliography (.bib) file containing the references	Single-use
\acknowledgements	Text appearing in second column of page 2	Single-use
\author	The authors of the report	Single-use
\contentspage	Load after the overview. Prints the table of contents and the list of figures	Single-use
\documentclass	Used at the top document. Loads the class (grattan)	Single-use
\GrattanReportNumber	Prints the report number on page 2. Use \GrattanWorkingPaperNumber for working papers	Single-use
\listoffigures	Print list of figures	Single-use
\listoftables	Prints list of tables	Single-use
\printbibliography	Prints bibliography	Single-use
\printendnotes	Prints endnotes if requested	Single-use

Table 4: List of all commands

\Command	Comment	Group
\title	The title of the report	Single-use
\$	\$ for a (literal) dollar sign	Special characters
\%	\% for a (literal) percentage sign	Special characters
\&	Literal ampersand logogram	Special characters
\,	Half-space kern	Technical
\@	Use \@ before a sentence-ending full stop preceded by a capital letter	Technical
\(	Use \(to begin math-mode. You should type \(-\) if you want a negative symbol.	Technical
\\	Line break in table	Technical

Part III.
Quick-reference

```
\begin{figure}
\Caption{Title}%
{Units}%
{xrefkey}
\includegraphics{path/to/figure}
\notes{Notes}
\source{Source}
```
Places a floating figure with caption, notes, and source.

```
\begin{table}
\caption{Table caption}
\begin{tabularx}{\linewidth}
\toprule
ColumnHeader1 & ColumnHeader2 \\
\midrule
Table entry 1 & Table entry 2 \\
\bottomrule
\end{tabularx}
\notes{}
\source{}
\end{table}
```
Places a floating table with caption, notes, and source.

```
\begin{overview}[-25pt]

\end{overview}
\begin{recommendations}[-25pt]

\end{recommendations}
```
Page of overview and recommendations.

Index