Yet Another Guide to Typesetting with LaTeX 2ε

v1.3.1

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Abstract

This document is a short guide to using LaTeX 2ε to typeset high quality documents. It focuses on users of Windows 10 and TeX Live 2024. It guides the reader through installation, some of LaTeX 2ε's conventions, and creating the front matter, body and end matter of a document. The appendices contain a list of useful facilities not covered in this document and a list of helpful resources.

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1 Introduction

LaTeX (pronounced *lah-tek*) is a markup language designed to typeset high quality documents. It was created by Donald Knuth who generously released it into the public domain. It is freely available from the Comprehensive TeX Archive Network (CTAN) at www.ctan.org. Since it's release it has been greatly added to, and as of this writing there are over 6600 add-on packages from over 3000 contributors. The most recent version is LaTeX 2_ε and LaTeX 3 is under development.

This document grew from my own efforts to become a proficient LaTeX user. It is not a comprehensive guide to using LaTeX. It is aimed at giving an overview of the elements of how to mark up a document and then compile it into either postscript or PDF format in English. It is a very bare bones outline of LaTeX and only touches on it's possibilities. The best source of information for additional functionality is the package documentation and there are also a number of very comprehensive published guides. The reference list contains several useful references. A more comprehensive list, and a helpful list of texts on typography is also available from the TeXUser Group at www.tug.org/books/.

This document focuses on the Windows 10 operating system and the TeX Live 2024 distribution. Users of UNIX-alike or Mac systems should consult their documentation for issues specific to them. There are a large number of packages and some of them overlap in functionality: there are multiple options for citation systems, for document templates and for fonts. The recommendations made in this document reflect my own experiences and prejudices. Anyone else's mileage may vary.

A previous version of this document was titled 'Getting Started with LaTeX 2_ε'. The name has been changed as it was too similar to other documents relating to LaTeX. 'Getting Started with LaTeX 2_ε' also used the ProTeXdistribution. This was retired in 2022, so the focus was changed to TeXLive. TeXLive 2024 is the most recent distribution available at the time of writing.

Finally, I'd like to mention The TeX Users Group, of which I am a member. This is a not-for-profit group for those interested in LaTeX. Membership is inexpensive and members are sent TUGboat, the Journal of the TeX Users Group, three times a year, and the TeX Collection on DVD annually. This is a good way of keeping up with developments and changes to TeX distributions.

The author is interested in hearing about errors and suggestions for improvements, especially code that doesn't function as advertised. Reports can be sent to the author at mmorris1k@gmail.com.

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2 Installation

LaTeX 2$_\varepsilon$ is freely available from www.ctan.org in two main distributions:

- TeX Live is cross platform and will install on UNIX-alike, Mac and Windows systems.
- MacTeX is aimed at Mac OS users.

This document uses TeX Live and is mainly aimed at users of Windows 10. The most current version of this, as of this writing, is Tex Live 2024. This can be downloaded in a number of ways from CTAN. For Windows 10 an installer may be downloaded and launched. It is also available as an ISO file for those who burn their own DVD's. This is is a large file: about 5.7gb. TeX Live is also available on DVD as part of the TeXCollection. This is distributed by the Tex User Group to members every year, and is available from the TUG store at www.tug.org/store/ along with stickers and other merchandise.

For those who are installing from DVD, the first step is to open it and click on `index.html`. This contains links to installation documentation in 14 languages. It provides instructions for Windows, Mac OS X and GNU/Linux systems.

After it is installed, the next step for Windows 10 users is to place it in the Windows search path. This will allow Windows to find it if it is run from the command line. To do this, go to the Control Panel:

`Control Panel` → `System and Security` → `System` → `Advanced System Settings` → `Environmental Variables` → `Path in the User Variables box` → `New in the edit environment variable box` → `Browse in the Edit environmental variable box`

Then browse to the directory containing the binary files. These are those with an `.exe` extension, and add it to the path. The default location for Tex Live 2024 is:

```
C:\texlive\2024\bin\windows
```

Browse to this folder and click `OK`, click `OK` again in the `Edit environmental variable` box, click `OK` again in the `Environmental Variables` box and click `OK` in the `System Properties` box.

This path will be loaded the next time Windows loads.

2.1 Package Management

LaTeX has a large number of individual packages that add functionality. CTAN currently has over 6600 packages from over 3000 contributors. These provide additional features, fonts, document templates and documentation. TeX Live provides the TeX Live Manager to help manage them. This provides facilities for updating packages and installing new ones. The TeX Live Manager can be accessed from the Windows 10 desktop by clicking

`Windows Start` → `TeX Live 2024` → `TLShell TeX Live Manager`

After the interface is loaded, the first thing to select is a package repository. These are online sites that mirror CTAN and will be the source of upgrades and new packages. To select your preferred repository, select:

`Options` → `Repositories`

A box will appear with options to select `Any CTAN mirror`, `Specific mirror` or `Local directory`. Select your preferred source, then click `Save and Load`.

The manager contains a section named `Package List`. This has options to list `Installed`, `Not installed`, `All` and `Updatable` packages.

To check for packages that are not yet installed, click `Not Installed` and a list of all the packages not installed on your system will appear. To install them, click the ∘ next to the package name so that it changes to a tick, then click `Install marked`.

To update currently installed packages, select `Updatable` and if any updates are found, they will appear as a list. As with installing new packages, select the packages and click `Update marked`. They will be downloaded and installed automatically.

Following the package installation or update, the file name database must be updated so that LaTeX can find the updated package/s. To do this, go to Menu, click on

`Actions` → `Regenerate filename database`

If new fonts have been installed, the fontmap files have to be refreshed as well. To do this, go to the console Menu, click on

`Actions` → `Regenerate fontmaps`

Several packages must be present on your system so that you can use the examples in this document. These are listed in Table 1 under the LaTeX 2_εcolumn. Those required to produce automated bibliographies are listed in the BibLaTeXcolumn and packages relating to common bibliographical styles are also listed.

Their presence on your system may be checked by clicking the `Not installed` option of the Package List section of the TeX Live Manager. This will list packages that are not yet installed.

If any of the required packages are missing, they can be installed using the instructions above. Some packages require access to additional packages and these must be present on your system as well: `ragged2e`, for instance, requires the packages `everysel` and `footmisc`. BibLaTeX, which automatically generates references and reference lists, requires 12 additional packages, not including style packages.

2.2 Additional Software

The software listed below is helpful for managing LaTeX projects. These are editors, a reference database, a document viewer and a means of converting images from one format to another.

LaTeX 2ε	BibLaTeX
babel	babel v3.9r or above or polygossia
booktabs	biber
datetime2	csquotes
everysel	etoolbox
fancyhdr	etex
fontenc	ifthen
footmisc	keyval
geometry	kvoptions
graphicx	logreq
hyphenat	pdftexcmds v0.27 or above
multirow	url
ragged2e	xpatch
setspace	
xcolor	
xmp	
	Bibliographical Styles
	biblatex-apa
	biblatex-chicago
	biblatex-mla
	biblatex-vancouver

Table 1: Required and recommended packages

Editors An editor makes marking up a text file and compiling it much simpler. Two freely available editors are TeX studio and Kile. TeX studio is available from:

www.texstudio.org

Kile is another popular choice with similar functionality to TeXstudio. It has a preview feature which shows how your document will look after it is compiled. It is available from:

www.kile.sourceforge.io

Reference Managers A reference manager is helpful for scholarly writing because it can keep all the references in a single place, and if the references and reference list is are to be generated automatically, it forms a database that the generator can refer to. Jabref and Zotero are both popular choices and are freely available. Jabref imports 15 reference formats and links to full text documents on the web. It is freely available from:

www.jabref.org

Zotero is also freely available and supports a large number of reference formats. It allows users to add PDF's, images and web pages to its databases and users can add their own annotations to each entry:

www.zotero.org

Document Viewers A fundamental requirement for LaTeX is a viewer so that typesetters can view their documents and plan adjustments. There are a large number of viewers for PDF files. Sumatra PDF is a freely downloadable and popular choice. There doesn't appear to be a supported postscript reader equivalent to any of the PDF readers even though postscript is the 'Gold Standard' format for printed documents. One way to go would be to create a PDF file as well as a postscript file for editing.

The latest version of Sumatra is available from:

www.sumatrapdfreader.org/free-pdf-reader

Image Software LaTeX handles a limited range of graphic formats so an image converter is useful. Image Magic is freely available and reads and writes over 200 graphic formats. Gimp is a full featured graphics editor that also converts graphic formats. Image Magic is available from:

www.imagemagick.org/script/index.php

Gimp is freely available from:

www.gimp.org

3 LaTeX Conventions

3.1 Project Management

The first step in creating a document with LaTeX is to write the text and save it as a plain text file into a project directory created specifically for that project. This text file is then marked up so that when it is compiled it becomes a formatted postscript or PDF document. The normal suffix for this file is `.tex`. During compilation, LaTeX will produce several other files and having a unique project directory will help keep all of them together. This directory should also contain any graphic files and reference databases so that LaTeX can find them.

3.2 Document Formats: Postscript vs PDF

One of the first things to consider is if the document is to be produced in postscript or Portable Document Format (PDF). Postscript is the 'gold standard' for printed documents and produces the highest quality files for printing. PDF supports hypertext links and live connections to websites and are somewhat smaller than postscript files. They are the preferred format for documents that will be read online.

3.3 LaTeX Documents

LaTeX documents have two parts: the preamble and the document text. The preamble defines the document's global properties such as the type of document, page size, fonts and margins and loads packages that contain functions that will be used to format the text.

The first command is `\documentclass[options]{TemplateName}`. This specifies the type of document: letter, article, book, etc, the font size and page size.

Packages are loaded with the `\usepackage[Options]{PackageName}` command. The required package name is placed between the curly braces and any options separated by commas are listed between square brackets:

```
\documentclass[Option1, Option2]{TemplateName}
\usepackage[Option1, Option2]{PackageName}
```

After the preamble comes the document text. This is contained inside the `document` environment and includes the text, graphs, tables, lists etc.

The simplest document uses LaTeX's default settings and requires only that the document class be specified and that the text be placed in the `document` environment. The following creates an article class document with everything else left at the default settings:

```
\documentclass{article}
\begin{document}

Document Text Here

\end{document}
```

3.4 Commands

Commands in LaTeX begin with a \. This is one of LaTeX's special characters and alerts LaTeX that the following is an instruction rather than text. This is followed by a command and the object of the command is often placed between curly braces: `\Command{Object}`. To format a section of text in italics, the `\textit{}` command tells LaTeX that the text inside the curly braces is to be formatted in italics:

```
\textit{Lorem ipsum dolor sit amet, consectetur adipiscing elit.}
```

produces

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

Commands are also used to select special characters. This can include LaTeX's control characters, symbols and diacritics. `$` is one of LaTeX's control characters. It informs LaTeX that the following code is to be executed in Math mode. For LaTeX to process it as a text character, a \ must be added: `\$` produces $. Commands for all of LaTeX's control characters are in Table 8.

It is always a good idea to annotate your code. Annotations can be added to LaTeX code by starting comment lines with a `%`. This will stop LaTeX from attempting to run it and returning an error message:

```
% This is a comment.
```

4 Preamble

Every LaTeX document has a preamble which contains instructions regarding document template, page size and other options that will affect it as a whole. It is the first part of any document and goes before the body of the text. The first line of the preamble is:

```
\documentclass[Options]{DocumentTemplate}
```

This specifies the template for the document. The base options are `article`, `book`, `letter` or `report`. There are a wide range of templates and some organisations produce their own. If one of these is required, it is named here and will be loaded when the document is compiled. After the template is selected, options define font size, paper size, number of columns and whether it is to be printed on one side of the page or two.

LaTeX's defaults are: a 10pt font size, a paper size of 8.5" x 11", which is the US standard letter size, portrait orientation, a separate title page for the report class, but not the others, typesetting in one column, and printing on one side of the page only. All these can be customised. A summary of commands and options are outlined in Tables 2 and 3.

Option	Command
Document Type	`letter, article, report, book`
Typeface Size (pts)	`10, 11, 12`
Title Page	`titlepage, notitlepage`
Columns	`onecolumn, twocolumn`
Layout	`oneside, twoside`

Table 2: Document class options

Size	Measurement(mm)	Command
A4	210 x 297	`a4paper`
A5	148 x 210	`a5paper`
B5	176 x 250	`b5paper`
Executive	185 x 267	`executivepaper`
Legal	216 x 356	`legalpaper`
Letter	216 x 279	`letterpaper`

Table 3: Paper sizes

The following code creates an article class document with A4 sized paper and a 12-point font. The other options will stay at their default settings:

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

After the document type is defined, packages that will be used are loaded with

```
\usepackage[Options]{PackageName}
```

The first package is `setspace`. This package supports single, one-and-a-half and double spacing with `\singlespacing`, `\onehalfspacing` and `\doublespacing`. This will change the spacing of the entire document, but figures, tables and footnotes will be unaffected. `setspace` is loaded in the preamble and the required spacing is specified in the document text after `\begin{document}`. LaTeX's default spacing is single spaced:

```
\documentclass[a4paper]{article}
\usepackage{setspace}
. . .
\begin{document}
\doublespacing
. . .
\end {document}
```

The `booktabs` package offers several tweaks to LaTeX's default tables. These add some extra space above and below lines and the ability to define the thickness of lines. It is loaded with:

```
\usepackage{booktabs}
```

The next package is `graphicx` which is part of the graphics bundle. It provides facilities to include graphics in documents with it's `\includegraphics{}` command.

```
\usepackage{graphicx}
```

`xcolor` provides support for coloured text, text background, page colour or a coloured box surrounding text. This is especially helpful for PDF documents that contain hot links as they can be highlighted. If no options are specified, 19 colours are available. Options `dvipsnames`, `svgnames` and `x11names` provide 68, 151 and 317 colours respectively. Colours and their designations for each of these options are provided in `xcolour's` documentation (Kern, 2024), which is available here. The documentation also illustrates each of the colours provided by each option. If specific colours are required, this package can produce them in rgb and cmyk format. The following loads `xcolor` with `dvipsnames` to provide 68 colour choices:

```
\usepackage[dvipsnames]{xcolor}
```

The `babel` package supports hyphenation for justified text and has facilities for about 200 languages. This includes three dialects of English: `english` refers to American and Canadian, `UKenglish` refers to British, and `australian` refers to Australian and New Zealand English. If the document contains text in multiple languages, all of them should be listed as options. As with English, here may be multiple options for each language: English has three and German, two. Consult the documentation for details on each one. The language listed last is the document's main language. The default is English. That is, American and Canadian english:

```
\usepackage[french, ngerman, australian]{babel}
```

This loads French, German and Australian English with Australian being the document's main language. To swap to one of the other languages in the text, use `\select language{LanguageName}` for blocks of text such as paragraphs, and `\foreignlanguage {LanguageName}{Text}` for text that is part of a paragraph:

```
Text in English.
\selectlanguage{french}
Texte en fran\c{c}aise.
\selectlanguage{australian}
Returns to Australian English.
```

or

```
\foreignlanguage{french}{Texte en Fran\c{c}ais.}
```

If LaTeX doesn't hyphenate words properly, they will run into the right-hand margin. To fix this, a list of troublesome words can be listed with the `hyphenat` package and it's `\hyphenation{}` command. These words are placed in hyphenation's curly braces divided into syllables with a -. For example, 'hyphenate' is defined as `hy-phen-ate` and preamble is `pre-am-ble`:

```
\usepackage[french, ngerman, australian]{babel}
\usepackage{hyphenat}
\hyphenation{hy-phen-ate pre-am-ble}
```

Dates can be added with datetime2. This package is loaded with

```
\usepackage{datetime2}
```

and the date itself inserted in the text with

```
\today
```

This will add the date the document was compiled in YYYY-MM-DD format so it will look like 2020-09-19. The format can be changed with the `useregional` option. This will set the date format so that it matches the language specified when `babel` was loaded. The `babel` example above specifies Australian English and will format the timestamp to DD MM YYYY. To add the day of the week, add the `showdow` option:

```
\usepackage[useregional, showdow]{datetime2}
```

The `fontenc` package gives access to the glyphs of language. This is done through what LaTeX refers to as encodings. The default, and LaTeX's original encoding option, is `OT1`. This gives access to glyphs for the English alphabet. Unfortunately, this encoding doesn't allow hyphenation of accented characters that appear in non-English latin alphabets. If the document is in English this doesn't matter, but if the document contains glyphs from other latin alphabets, the encoding should be changed to `T1`. This has a wider range of glyphs. LaTeX provides encodings for a range of languages: Cyrillic, African Latin, Vietnamese, Greek, Armenian etc. If text for languages in alphabets other than latin are included in your document, encodings for these will have to be loaded as well. For more on this, see Mittelbach, et al (2016).

TS1 is a coding that gives access to symbols. This can be loaded at the same time as the font encoding(s). The required encodings are specified in options. To load both T1 and TS1 encodings:

```
\usepackage[TS1, T1]{fontenc}
```

LaTeX's default setting for text alignment is justified with both edges of the text block aligned evenly. If the text block should be left aligned with a ragged right side, `ragged2e` will format the text as this for the entire document with the `document` option. To use this package, two additional packages should be present on your LaTeX installation. These are `everysel` and `footmisc`. The following loads `ragged2e` and sets the document text alignment to left aligned with a ragged right side:

```
\usepackage[document]{ragged2e}
```

The next line specifies the font. If it is not defined, it will default to Computer Modern, which is LaTeX's original font. LaTeX provides a wide range of fonts with an option to install more if required. This example loads Latin Modern with the package name `lmodern`.

```
\usepackage{lmodern}
```

Table 4 contains a short font sampler and package names.

Font Name	Package Name	Sample Text
Avant Garde	`avant`	Lorem ipsum dolor sit amet
Bookman	`bookman`	Lorem ipsum dolor sit amet
Charter	`charter`	Lorem ipsum dolor sit amet
Courier	`courier`	`Lorem ipsum dolor sit amet`
Computer Modern	`cmodern`	Lorem ipsum dolor sit amet
Helvetica	`helvet`	Lorem ipsum dolor sit amet
Latin Modern	`lmodern`	Lorem ipsum dolor sit amet
New Century Schoolbook	`newcent`	Lorem ipsum dolor sit amet
Palatino	`mathpazo`	Lorem ipsum dolor sit amet
Times New Roman	`mathptmx`	Lorem ipsum dolor sit amet
Utopia	`utopia`	Lorem ipsum dolor sit amet

Table 4: A short font sampler

Margins can be adjusted from the defaults with the `geometry` package. The left, right, top, and bottom margins can all be specified with this, and an allowance made for binding if the document is to be bound. It accepts units in millimetres, centimetres, points, and inches (mm, cm, pt, in). The options are listed in Table 5.

If headers and footers are contained in the document, LaTeX may sometimes return an error message to say that the headheight is too small. This can be corrected with the `\headheight` option. For this document I have set the headheight to 1.5× the point size of the text for a headheight of 18pt. The header is designed to hold a single line of text, but can be adjusted to accommodate multiple lines. The following code sets the left margin at 1.5 inches, the right margin at 1 inch, the top margin at 1 inch, the bottom margin at 1.75 inches and the height for the header to 18 point:

Option	Comment
`left`	Left Margin
`right`	Right Margin
`top`	Top Margin
`bottom`	Bottom Margin
`bindingoffset`	Add space for binding
`headheight`	Changes the size of the header

Table 5: Geometry options

```
\usepackage[left=1.5in, right=1.0in, top=1.0in, bottom=1.75in,
headheight=18pt]{geometry}
```

The page margins can be changed mid-document with `\newgeometry{}`. It reverts to the original settings with `\restore{geometry}`. The `\newgeometry{}` command has the same options as those used by geometry in the preamble:

```
\newgeometry{left=0.5in, right=0.5in, top=0.5in, bottom=0.5in}
```

This changes the margins to a uniform 0.5 inches. To change it back:

```
\restore{geometry}
```

Headers and footers are handled by the `fancyhdr` package. This package provides header and footer placement to the left, centre and right and customizable lines for both headers and footers. The pagestyle should be changed to fancy if this package is used:

```
\usepackage{fancyhdr}
\pagestyle{fancy}
```

There are six locations available: left, centre and right headers and footers. The location and contents of each header or footer is specified as:

```
\lhead{Left Top}
\chead{Centre Top}
\rhead{Right Top}
\lfoot{Bottom Left}
\cfoot{Bottom Centre}
\rfoot{Bottom Right}
```

The text of the header or footer is contained between the curly braces. These can contain page numbers and dates generated using `\thepage` and `\today` respectively. Decorative lines can be added to both headers and footers with

```
\renewcommand{headrulewidth}{0.5pt}
\renewcommand{footrulewidth}{0.5pt}
```

This will place lines that are 0.5 points wide beneath the header and above the footer. Line weights can be increased and decreased between 0.0 and 1.0. A line weight of 0.0pt produces no lines.

The following code loads `fancyhdr` and places a running header or title top left, page numbers top right, today's date stamp bottom left and decorative lines 0.5 points thick below the footer and above the header:

```
\usepackage{fancyhdr}
\pagestyle{fancy}
\lhead{Running Header or Title.}
\chead{}
\rhead{\thepage}
\lfoot{\today}
\cfoot{}
\rfoot{}
\renewcommand{\headrulewidth}{0.5pt}
\renewcommand{\footrulewidth}{0.5pt}
```

5 Text

The body of the text for LaTeX documents is enclosed in the document environment:

```
\begin{document}
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus.
\end{document}
```

A blank line between two sections of text, or `\par`, denotes a paragraph break and `\\` starts a new line.

Page breaks can be inserted with `\newpage` or `\clearpage`. `\clearpage` is preferred if the document contains chapters or sections with tables or figures. This will place them at the end of their section if LaTeX is unable to place them in the text.

5.1 Fonts and Styles

The base font and size for LaTeX documents is loaded in the preamble. Font styles, such as **bold** or *italic* can be changed in the body of the text. A list of font styles and their commands are contained in Table 6. These can be changed in two ways. The first is to insert the text in curly braces following a command. This

```
\textit{Lorem ipsum dolor sit amet . . .}
```

formats the text between the curly braces in italics as

Lorem ipsum dolor sit amet . . .

This is useful for single words or sentences, but for blocks of text an environment is convenient:

```
\{begin{itshape}
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus. Curabitur eu est et leo feugiat auctor vel quis lorem. \\
\end{itshape}
```

This produces:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus, ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor rhoncus. Curabitur eu est et leo feugiat auctor vel quis lorem.

Fonts can be made larger or smaller from Tiny to Normal Size to Huge in a similar way. For fonts in 12pt, `huge` and `Huge` sizes are identical. 10 and 11pt font sizes show a difference. Table 7 gives commands for resizing fonts.

If the `xcolor` package is loaded, fonts, font backgrounds and pages can be re-coloured. `{\color {ColorName}{Text}` changes the colour of text inside the curly braces. To change it to red:

Style	Command	Sample
Roman	`\textrm{}`	Roman
Sans Serif	`\textsf{}`	Sans Serif
Typewriter	`\texttt{}`	`Typewriter`
Italics	`\textit{}`	*Italics*
Boldface	`\textbf{}`	**Boldface**
Small Caps	`\textsc{}`	Small Caps
Underline	`\underline{}`	Underline
Emphasis	`\emph{}`	*Emphasis*
Slanted	`\textsl{}`	*Slanted*

Table 6: Text styles

Command	Sample
`\tiny{}`	Lorem ipsum dolor sit amet
`\scriptsize{}`	Lorem ipsum dolor sit amet
`\footnotesize{}`	Lorem ipsum dolor sit amet
`\small{}`	Lorem ipsum dolor sit amet
`\normalsize{}`	Lorem ipsum dolor sit amet
`\large{}`	Lorem ipsum dolor sit amet
`\Large{}`	Lorem ipsum dolor sit amet
`\LARGE{}`	Lorem ipsum dolor sit amet
`\huge{}`	Lorem ipsum dolor sit amet
`\Huge{}`	Lorem ipsum dolor sit amet

Table 7: Font sizes

```
\color{red} {Lorem ipsum dolor sit amet, consectetur adipiscing elit.}
```

produces:

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

`\colorbox{}` changes the background colour, in this case to Sea Green:

```
{\colorbox {SeaGreen}{Lorem ipsum dolor sit amet Lorem ipsum dolor
sit amet}}
```

produces

Lorem ipsum dolor sit amet Lorem ipsum dolor sit amet

Both can be changed by specifying the background colour and the text colour:

```
\colorbox{SkyBlue}{\color{Red} Lorem ipsum dolor sit amet}
```

produces:

Lorem ipsum dolor sit amet

5.2 Special Characters

The following symbols are used by LaTeX as part of it's programming instructions so require marking up if they are to be placed in a document as text:

{ } % & $ _ # \~ ^

These and the commands to produce them along with a range of other common symbols are in Table 8.

Quotation marks are produced by using the ` and ' keys: `Word' produces 'Word'. For double quotes, use two of each: ``Word'' produces "Word". The ` key is located at the top left of the keyboard below the esc key. The ' symbol is the usual single quotation mark. The " key on the keyboard is not used. Three dashes are available: the hyphen (- produces -: 'The syllables of hyphenate are hy-phen-ate') the en dash for ranges (-- produces –: 1939–45) and the em dash for punctuation (--- produces —: 'Your profundities — My truisms').

Symbol	Command	Symbol	Command
{	\{	-	-
}	\}	–	--
%	\%	—	---
&	\&	·	\textperiodcentered
$	\$	•	\textbullet
_	_	○	\textopenbullet
#	\#	...	\textellipsis
\	\textbackslash	*	\textasteriskcentered
‘	`	√	\textsurd
’	'	£	\textsterling
“	``	€	\texteuro
”	''	¥	\textyen
℃	\textcelsius	¢	\textcent
°	\textdegree	©	\textcopyright

Table 8: Special characters and some common symbols

This list is a very small sample of the symbols available in LaTeX. Scott Pakin maintains 'The Comprehensive LaTeX Symbol List' which provides a list of over 20,000 symbols. This list is freely available from CTAN here.

LaTeX supports a wide range of mathematical symbols. If these are required, they can be handled by entering math mode. Please see the discussion below for more details on this.

5.3 Accents and Non-Latin Glyphs

Most glyphs that have diacritics in latin alphabets, such as German Ä ä; Ö ö, Ü ü, Spanish ñ, Polish Ą ą, Ć ć, Ę ę, Ń ń, etc can be represented by using the commands in

Table 9. LaTeX also provides non-latin glyphs for the alphabets that have them, such as the German Eszett (ß) and Scandinavian O-Slash (Ø or ø). These can be produced by the commands in Table 10. Table 11 contains commands for some punctuation marks such as the guillemots, Spanish ¡ and ¿, and base quotes „. Some of these glyphs combine with the following word automatically so it can be challenging to represent them as single letters if this is required. The code `\ss is a German letter` might compile as 'ßis a German letter'. This may be fixed by inserting a \ after `\ss`: `\ss\ is a German letter` compiles as 'ß is a German letter'.

Diacritic	Code	Example
Acute	`\´{}`	á
Breve	`\u{}`	ă
Caron / Haček	`\v{}`	ǎ
Cedilla	`\c{}`	ą
Circumflex	`\^{}`	â
Dot	`\.{}`	ȧ
Grave	`\'{}`	à
Hungarian Umlaut	`\H{}`	ő
Macron	`\={}`	ā
Ogonek	`\k{}`	ą
Tilde	`\~{}`	ã
Umlaut	`\"{}`	ä

Table 9: Common diacritics

Name	Upper Case	Lower Case
German		
Eszett		`\ss` ß
Polish		
Barred L	`\L` Ł	`\l` ł
Scandinavian		
Ash	`\AE` Æ	`\ae` æ
Eth	`\dh` Ð	`\dh` ð
OE ligature	`\OE` Œ	`\oe` œ
O-Slash	`\O` Ø	`\o` ø
Ring-A	`\r{A}` Å	`\r{a}` å
Thorn	`\TH` Þ	`\th` þ

Table 10: Some non-latin alphabetical glyphs

Name	Symbol	Command
Double Guillemot: Left	«	`\guillemetleft`
Double Guillemot: Right	»	`\guillemetright`
Single Guillemot: Left	‹	`\guilsinglleft`
Single Guillemot: Right	›	`\guilsinglright`
Exclamation Down	¡	`\textexclamdown`
Question Mark Down	¿	`\textquestiondown`
Base quote: Double	„	`\quotedblbase`
Base Quote: Single	‚	`\quotesinglbase`
Elipsis	...	`\textellipsis`

Table 11: Punctuation marks

6 Body

6.1 Sectioning

Sectioning is the division of a document into parts, chapters, sections, subsections, subsubsections, paragraphs, and subparagraphs. These divisions are available for all LaTeX document classes, apart from letter. Chapters are not available for article class documents. Sectioning commands have the same format as text formatting commands:

`\SectionType{SectionTitle}`.

LaTeX numbers sections automatically and the text of the `SectionTitle` will appear in the Table of Contents. The following creates two sections, each with two subsections:

```
\section{Topic 1}
\subsection{Point 1}
\subsection{Point 2}

\section{Topic 2}
\subsection{Point 1}
\subsection{Point 2}
```

6.2 Environments

Environments are used in the body of the document to define a particular type of text. These range from abstracts, tables and figures, lists and sections of text with differing justification, etc. LaTeX environments are enclosed with `\begin{EnvironmentName}` and `\end{EnvironmentName}`. A short list of environments is in Table 12:

```
\begin{EnvironmentName}
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus.
\end{EnvironmentName}
```

The verbatim environment prints in a typewriter font with no formatting. If the text isn't broken with a `<return>`, it produces text in one long line which may run across the page, into the right-hand margin and then off the page entirely. The first 100 digits of π may appear in your editor as

```
The first 100 digits of $\pi$: \\
3.14159265358979323846264338327950288419716939937510582097494459
230781640628620899862803482534211706 79
```

but when the document is compiled, it produces:

The first 100 digits of π:
3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706 79

Environment	Description
`abstract`	Text of a document's abstract.
`centre`	Centred text.
`flushleft`	Left aligned text.
`flushright`	Right aligned text.
`description`	Labelled lists.
`enumerate`	Numbered lists.
`itemize`	Bulleted lists.
`quotation`	Include quotes.
`verbatim`	Text in typewriter font that that will appear exactly as typed.
`table`	Floating tables.
`figure`	Floating figures.

Table 12: Environment options

This can be fixed by breaking the text into lengths that don't cross into the margins. In this example, it is broken into 25-digit sections with a `<return>` to signal the end of a line:

```
The first 100 digits of $\pi$: \\
3.14159265358979323846264 3 <return>
38327950288419716939937510 <return>
58209749445923078164062862 <return>
0899862803482534211706 79
```

This produces:

The first 100 digits of π:
3.14159265358979323846264 3
38327950288419716939937510
58209749445923078164062862
0899862803482534211706 79

6.3 Lists

Lists may be bulleted or numbered and are created with the `itemize` and `enumerate` environments respectively. List items are specified with `\item Item Text`. For a bulleted list:

```
\begin{itemize}
\item Item 1
\item Item 2
\item Item 3
\end{itemize}
```

produces:

- Item 1
- Item 2
- Item 3

The symbol denoting each item in a bulleted list can be changed by adding an option after each `\item` command in square brackets:

```
\begin{itemize}
\item[--] Item 1
\item[\textasteriskcentered] Item 2
\item[\textdagger] Item 3
\end{itemize}
```

produces:

– Item 1

∗ Item 2

† Item 3

Numbered lists are created by the enumerate environment:

```
\begin{enumerate}
\item Item 1
\item Item 2
\item Item 3
\end{enumerate}
```

produces:

1. Item 1
2. Item 2
3. Item 3

Lists can be nested with additional enumerate commands. Each sub-category is contained within its own enumerate environment.

```
\begin{enumerate}
\item Item 1
\begin{enumerate}
\item Item A
\item Item B
\item item C
\end{enumerate}
\item Item 2
\item Item 3
\end{enumerate}
```

produces:

1. Item 1
    (a) Item A
    (b) Item B
    (c) Item C
2. Item 2
3. Item 3

6.4 Tables

LaTeX has substantial facilities for generating tables. These can range in design from simple 2×2 tables to complex tables with merged columns and rows. This section makes use of the `booktabs` package. This package offers several tweaks to LaTeX's default tables. They add some extra space above and below lines and the ability to define the thickness of lines. It is loaded in the preamble with:

```
\usepackage{booktabs}
```

Tables are placed inside the `table` environment. LaTeX places them in the document so that they don't break across pages. Because their location, like those of figures, can vary from the location specified by typesetters, they are referred to as floats. Using `\clearpage` at the end of each document section places any outstanding floats at the end of the section before the new one begins.

6.4.1 Basic Tables

Tables consist of two nested environments: `table`, and `tabular`. The code below gives some basic commands for a centre justified table:

```
\begin{table}[Location]
\begin{centre}
\begin{tabular}{Cell Alignment and size}

{. . . Table Contents . . . }

\end{tabular}
\caption{Caption Text}
\end{center}
\end{table}
```

`\begin{table}` has a [Location] option to help place the table on the page. This can be at the top of the page with `t`, the bottom of the page with `b`, here with `h` and on a separate page of floats with `p`. These commands can be enforced a bit more with `!`. `\begin{table}[!h]` places a table where it appears in the code. All of this, however, will be subject to LaTeX's rules on table placement.

The next line justifies the table on the page. This can be `centre`, `flushleft` or `flushright`.

The table cell's formatting and contents are placed in the `tabular` environment. Instructions relating to the number of columns, their alignment and if there are vertical lines seperating the columns are on the same line as `\begin{tabular}` in curly braces. The number of alignment instructions should match the number of columns: one for each column. The options are `l` = left aligned, `c` = centred and `r` = right aligned. LaTeX will automatically adjust the column width to the contents.

`p{ColumnWidth}` may be used to define the width of a column if required. The width may be specified in millimetres (mm), centimetres (cm), and inches (in). The size of the table's font may be reduced by placing a `\FontSize` command after the beginning of the table environment.

Vertical lines are added with a `|` placed between the alignment commands. This key is located on the keyboard below `backspace`. Horizontal lines with definable thicknesses are available. There are three commands: `\toprule [Width]`, `\midrule[Width]` and `\bottomrule[Width]`. These commands accept measurements in points (pt), millimetres (mm), centimetres (cm) and inches (in). Finally, a caption may be added with `\caption`. The caption will appear in the Tables section of the Table of Contents when the document is compiled.

The code below shows the two nesting levels for a table with four columns. The table is placed at it's location in the document's text with the `[h]` option. It is centre justified on the page with the center environment. Column 1 is left aligned, column 2 centred, column 3 right aligned and column 4 has a user defined width of 5cm. Vertical lines separate columns 1–2, 2–3 and 3–4. A caption is placed at the bottom of the table:

```
\begin{table}[h]
\begin{center}
\begin{tabular}{l|c|r|p{5cm}}

{. . . Table Contents . . . }

\end{tabular}
\caption{Caption text}
\end{center}
\end{table}
```

Table data is placed inside the `tabular` environment. Each cell is separated with an `&`, and the end of each row is specified with `\\`.

The following example creates a table with four columns and four rows. The first row contains the column headings with lines above and below it with another line at the bottom of the table. These lines are defined in points with the top and bottom lines 1.0 points thick and the middle line 0.5 points thick. Table 13 shows the compiled output. The font size has been slightly reduced with `\small`.

```
\begin{table}[h]
\small
\begin{center}
\begin{tabular}{l|c|r|p{5cm}}
\toprule[1.0pt]
Column 1 & Column 2 & Column 3 & Column 4 \\
\midrule[0.5pt]
Row 1 & Text 2 &  3.157 & Lorem ipsum dolor sit amet, consectetur
adipiscing elit. \\
Row 2 & Text 2 & 14.930 & Nulla est purus, ultrices in porttitor in,
```

```
accumsan non quam. \\
Row 3 & Text 2 &  0.720 & Nam consectetur porttitor rhoncus. Curabitur
eu est et leo feugiat auctor vel quis lorem. \\
\bottomrule[1.0pt]
\end{tabular}
\caption{Sample table}
\end{center}
\end{table}
```

Column 1	Column 2	Column 3	Column 4
Row 1	Text 2	3.157	Lorem ipsum dolor sit amet, consectetur adipiscing elit.
Row 2	Text 2	14.930	Nulla est purus, ultrices in porttitor in, accumsan non quam.
Row 3	Text 2	0.720	Nam consectetur porttitor rhoncus. Curabitur eu est et leo feugiat auctor vel quis lorem.

Table 13: Sample table

Horizontal lines can be placed across a selection of columns with `\cmidrule`. This command requires the line thickness and the column number/s the line will appear at.

```
\cmidrule[LineThickness]{ColumnNumbers}
```

The following code produces a table with three columns with headings with horizontal lines. The middle line covers columns 1–2 of the three table columns. The output is Table 14.

```
\begin{table}[h]
\small
\begin{center}
\begin{tabular}{lll}
\toprule[1.0pt]
Column 1 & Column 2 & Column 3 \\
\cmidrule[0.5pt]{1-2}
Row 1 & Text 1 & Lorem ipsum dolor sit amet \\
Row 2 & Text 2 &  Nulla est purus \\
\bottomrule[1.0pt]
\end{tabular}
\caption{Sample Table: Partial horizontal lines}
\end{center}
\end{table}
```

Lines can cover any combination of columns. For a single column, specify the column number/s only. Although the line may cover only one column, both the beginning and end columns should still be specified, in this case a line 1 point thick over column 1:

Column 1	Column 2	Column 3
Row 1	Text 1	Lorem ipsum dolor sit amet
Row 2	Text 2	Nulla est purus

Table 14: Sample Table: Partial horizontal lines

```
\cmidrule[1.0pt]{1-1}
```

For multiple separated columns on the same row, the command can be used as many times as necessary. To place them in columns 1 and 3–4:

```
\cmidrule[1.0pt]{1-1} \cmidrule[1.0pt]{3-4}
```

6.4.2 Combining columns

Columns can be merged with `\multicolumn`. This command requires the number of columns to merge, the alignment of the column text and the text for the merged columns:

```
\multicolumn{MergedColumns}{Alignment}{text}
```

The following code merges the top row of columns 1–3 of a four column table and gives it a heading with centred text. If the number of merged columns is less than the total number, the extra columns should be signified with an `&` and the end of the row should be marked with a `\\` as usual. In the example below, only the first three columns are merged, so the fourth should be signified with an `&`. The output is in Table 15:

```
\begin{table}[h]
\small
\begin{center}
\begin{tabular}{lcrp{5cm}}
\toprule[1pt]
\multicolumn{3}{c}{Combined Columns} & \\
Column 1 & Column 2 & Column 3 & Column 4 \\
\midrule[0.5pt]
Row 1 & Text 2 & 3.157  & Lorem ipsum dolor sit amet, consectetur
adipiscing elit. \\
Row 2 & Text 2 & 14.930 & Nulla est purus, ultrices in porttitor in,
accumsan non quam. \\
Row 3 & Text 2 & 0.720  & Nam consectetur porttitor rhoncus. Curabitur
eu est et leo feugiat auctor vel quis lorem. \\
\bottomrule[1pt]
\end{tabular}
\caption{Sample table: Combined columns}
\end{center}
\end{table}
```

	Combined Columns		
Column 1	Column 2	Column 3	Column 4
Row 1	Text 2	3.157	Lorem ipsum dolor sit amet, consectetur adipiscing elit.
Row 2	Text 2	14.930	Nulla est purus, ultrices in porttitor in, accumsan non quam.
Row 3	Text 2	0.720	Nam consectetur porttitor rhoncus. Curabitur eu est et leo feugiat auctor vel quis lorem.

Table 15: Sample table: Combined columns

6.4.3 Combining Rows

Rows can also be combined with the `\multirow` command from the `multirow` package. This command requires the number of rows to be combined, the width, and the text for the multiple row cell. Width may be specified in the same way as a `p{}` alignment with a specified width, or it may be automatically set to it's natural width. LaTeX's natural width is selected by inserting an `*` in the width option:

```
\multirow{NumberOfRows}{Width}{Text}
```

The code below creates a table with three columns. The first column contains three merged rows with the column's width set to natural with an $*$. The second and third columns contain data in the normal way.

```
\begin{table}[h]
\small
\begin{center}
\begin{tabular}{cll}
\toprule[1.0pt]
\multirow{3}{*}{Start Time} & Early    & Topic 1 \\
                            & Mid-day  & Lunch   \\
                            & Late     & Topic 2 \\
\bottomrule[1.0pt]
\end{tabular}
\end{center}
\caption{Sample Table: Combined rows}
\end{table}
```

6.4.4 Combined Columns and Rows

Columns and rows can be combined to produce very complex tables. The code below produces a table for seminar times. It combines columns for the headings and rows for the times. The output is Table 17.

Start Time	Early Mid-day Late	Topic 1 Lunch Topic

Table 16: Sample Table: Combined rows

```
\begin{table}[h]
\small
\begin{center}
\begin{tabular}{clll}
\toprule[1.0pt]
\multicolumn{4}{c}{Seminar Timetable} \\
\midrule[0.5pt]
\multicolumn{3}{c}{Times} & Titles \\
\midrule[0.5pt]
\multirow{8}{*}{Day} & \multirow{2}{*}{Monday}    & Morning    & Topic 1 \\
                     &                            & Afternoon  & Topic 2 \\
                     &                            &            &         \\
                     & \multirow{2}{*}{Tuesday}   & Morning    & Topic 3 \\
                     &                            & Afternoon  & Topic 4 \\
                     &                            &            &         \\
                     & \multirow{2}{*}{Wednesday} & Morning    & Topic 5 \\
                     &                            & Afternoon  & Topic 6 \\
\bottomrule[1.0pt]
\end{tabular}
\end{center}
\caption{Sample Table: Combined columns and rows}
\end{table}
```

Seminar Timetable			
Times			Titles
Day	Monday	Morning	Topic 1
		Afternoon	Topic 2
	Tuesday	Morning	Topic 3
		Afternoon	Topic 4
	Wednesday	Morning	Topic 5
		Afternoon	Topic 6

Table 17: Sample Table: Combined columns and rows

6.5 Figures

LaTeX works with quite a limited range of graphic formats. Postscript documents can only contain graphics in postscript or encapsulated postscript formats. These are files with a (`.ps`) or (`.eps`) extension and are vector formats. Documents created by pdfTeX may contain graphics in `pdf`, `png`, `jpeg` or `jbig2` formats. These are raster formats. If the file is in a different format, it will have to be converted to one of these. Image Magic or GIMP have facilities to convert from one format to another and are both freely downloadable.

When working with image files, there are a number of issues to be considered before they can be placed into a document. This is the file format, resolution, colour depth and colour space. This is especially true for documents that are printed commercially as print bureaus often have specific requirements. When they are ready, images contained in the document should be placed in the project's working directory so that LaTeX can find them when the document is compiled.

6.5.1 Choosing a Graphic Format

Vector Formats Vector formats, such as postscript (`.ps`) and encapsulated postscript (`.eps`), are based on geometric concepts such as points, lines, and curves. Vector format file sizes are relatively small because the file contains only the instructions for the points, lines and curves that make up the image. It is most often used for line art, such as diagrams, graphs, 3D models, etc. It has the advantage that it can be upsampled or downsampled (enlarged or shrunk) without any loss of quality. Postscript is the 'gold standard' for printed documents but unfortunately, postscript only works with whole pages. Encapsulated postscript works with files of any size so this is the preferred format for images. These are the only two formats that can be placed in postscript documents.

Raster Formats Raster images are made up of pixels. Each pixel has a value relating to its individual colour. They are produced by digital cameras, scanners, etc and the file sizes are relatively large. These formats cannot be manipulated, that is resized, rotated, etc without losing information. To minimize this, image processing should be completed before they are inserted into a LaTeX document and the image sized to the dimensions that it will be printed at. pdfLaTeX supports four raster formats: PNG, JPEG. JBIG2 and PDF.

JPEG is a file format for images developed by the Joint Photographic Experts Group. This is a compressed file format and has the file extension .jpg. This compression makes these files appropriate for distribution over the World Wide Web and for use in documents that will be viewed on a compter screen. Their relatively small file size makes for efficient use of storage space, fast transmission over the Web and for loading documents with reduced or no lag.

JPEG is a 'lossy' format because it achieves smaller file sizes by permanantly removing information. This information cannot be restored and the higher the level of compression, the smaller the file, the greater the information loss and the more the image degrades.

This format does not support transparency. This is an option to remove background colours from images. This may be useful when working with graphs and line drawings.

JPEG's are not suitable for editing in a graphics editor because even saving these files introduces artifacts and the more often it is saved, the more artifacts will be introduced. If a small file size is required, an appropriate work flow may be to work on the image in an alternative format, such as a camera's RAW format or a TIFF file, then save the final production as a `.jpg`.

PNG pronounced 'ping', stands for Portable Graphic Format. This is also a compressed file format. It supports 'lossless' file compression. That is, when PNG files are compressed, no information is lost. PNG also supports transparency so that image backgrounds may be removed. Metadata may also be added to images in this format. This may include information about when and where the image was created, camera settings, colour profile, etc.

JBIG2 was developed by the Joint Bi-level Image Experts Group. JBIG2 is used as a format for scanned images of documents. This may be helpful for preserving historical documents, or for organisations that have a lot of digitised records.

PDF stands for 'Portable Document Format'. These files are not compressed and while at the same time are relatively small. PDF is suitable for images that contain both textual and graphic elements, such as plots. Any fonts that PDF's contain should be embedded before they are included in a LaTeX document. This means that a copy of the fonts included in the graphic are included with the image file. If they are not embedded, fonts on the current user's system will be substituted. If they are not the same, the image will not appear as it's creator intended.

6.5.2 Additional Factors

Resolution Images to be viewed on a computer screen have their resolution expressed in pixels per inch `(ppi)`. This refers to the number of pixels that the image will take up on a computer monitor. The actual proportion of the screen taken up by an image depends on the monitors resolution: images take up more screen area on monitors with lower resolutions. There is some debate regarding an optimal ppi, but a defacto standard appears to be 72ppi. These images are *not* suitable for printing. They will appear fuzzy and indistinct and pixilated.

The resolution of images to be printed is described in terms of dots per inch (dpi). This refers to the number of dots a printer can put on paper. Most commercial images in books and magazines are 300dpi. This gives a crisp clear image and the file sizes are not too big. It is possible to increase resolution to 600dpi if the image contains very fine lines or very small fonts.

Colour Depth Colour depth, or bit depth, refers to the number of colours available to any given image. An 8 bit image can display 256 colours, a 16 bit can display 65000 colours and a 24 bit image can display 16.7 million colours. Images, especially photographs, with a higher colour depth will appear more realistic and vibrant.

Colour Space A colour space is a model that describes a particular colour in terms of numbers. Two common colour spaces are RGB and CMYK. As mentioned above, raster format files have pixels that have a number attached to them that describes the pixel's colour. RGB describes colours in terms of the proportion of red, green and blue. The colour code for Royal Blue in rgb is 65, 105, 225. CMYK uses four values to represent colours and these are derived from the amount of cyan, magenta, yellow and key. Key is usually black and is used for shading colours produced by mixing the other three. A CMYK colour space describes Royal Blue as 71, 53, 0, 12.

If the document is to be printed professionally, the printers should be consulted for their requirements. These may include specific file formats, resolution, a colour space, often cmyk or rgb, and colour depth. These are best edited with dedicated graphics software. A large number of these are available, both commercial and non-commercial.

6.5.3 Placing Figures in LaTeX Documents

The first step in placing graphics in LaTeX documents is to place the file in the project directory so that LaTeX can find it when the document is compiled. Images are placed on the page inside the `figure` environment. This is a float and the same positioning commands may be used as with tables: `h`, `t`, `b` or `p`. The figure may be aligned on the page with: `centre`, `flushleft` or `flushright`. The graphic is selected with `\includegraphics`. This command requires the name of the graphic file and has a `scale` option that tells LaTeX to resize it: 1.0 is the normal size, 0.5 is half size and 2.0 is double size. Captions are added in the same way as tables with `\caption{}`.

The code below loads a Portable Document Format file named `Drawing.pdf` as a centred graphic in the `figure` environment with a caption. The caption text will appear as the figure title in the List of Figures in the front matter when the document is compiled. `\includegraphics{}` tells LaTeX the name of the graphic file to load and `scale` specifies whether to reduce or enlarge: 1.0 is original size, 0.5 is half size and 2.0 is double. In this case, the file size is reduced to 50% of the original which is about 10cm square. The code below inserts figure 1.

```
\begin{figure}[h]
\center
\includegraphics[scale=0.5]{Drawing.pdf}
\caption{Spiral}
\end{figure}
```

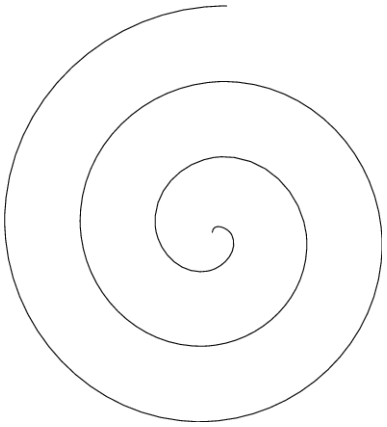

Figure 1: Spiral

6.6 Page Numbering

The default page numbering in LaTeX is Arabic numerals which begin on the first page. Table 18 shows the available styles:

Style	Numeral Type	Example Text
`arabic`	Arabic numerals	1, 2, 3, 4, 5
`roman`	Lower-case Roman numerals	i, ii, iii, iv, v
`Roman`	Upper-case Roman numerals	I, II, III, IV, V
`alph`	Lower-case letters	a, b, c, d, e
`Alph`	Upper-case letters	A, B, C, D, E

Table 18: Page numbering options

If the page numbering for the document is to be other than arabic, it can be specified after `\begin{document}` with `\pagenumbering{StyleName}`:

```
\documentclass[a4paper]{article}

. . .

\begin{document}
\pagenumbering{StyleName}

Document Text

\end{document}
```

It is possible to have two styles in a document, for instance lower case Roman numerals for the front matter including the index, Table of Contents, List of Figures, etc, and Arabic numerals for the remainder of the text.

This is handled with `\pagenumbering{StyleName}`. At the beginning of the front matter, insert `\pagenumbering{roman}` and when the document text begins, insert `\pagenumbering{arabic}`. If the title page is to be un-numbered, insert `\thispagestyle{empty}` following `\maketitle`.

The following creates an article class document with an un-numbered title page containing an abstract, a Table of Contents, List of Figures and List of Tables on separate pages with Roman numerals and the body text in Arabic numerals.

```
\documentclass[a4paper]{article}
\title{The Lost Secrets of \LaTeXe}
\author{Albertus Magnus}

\begin{document}
\maketitle
\thispagestyle{empty}
```

```
\begin{abstract}
Abstract text.
\end{abstract}

\clearpage
\pagenumbering{roman}
\tableofcontents
\clearpage

\listoffigures
\clearpage

\listoftables
\clearpage

\pagenumbering{arabic}

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus . . .

\end{document}
```

To change the page numbering counter, use `\setcounter{page}{PageNumber}`.

```
\pagenumbering{arabic}
\setcounter{page}{5}
```

This changes the page numbering to Arabic and begins the page count at page 5.

7 Mathematics in LaTeX

One of LaTeX's strengths is its facilities for mathematical equations. This is done by either activating math mode, or by using the `equation` or `displaymath` environments.

Math mode is activated by enclosing a mathematical expression within a pair of `$`. This is especially useful when mathematics is set within text, such as the results of a statistical test, in a report:

```
... main effect for the interaction between the factors was significant $(F(2,
125) = 3.146, p < 0.05, \omega^2 = 0.032)$, though the
practical significance ...
```

produces

. . . main effect for the interaction between the factors was significant
$(F(2, 125) = 3.146, p < 0.05, \omega^2 = 0.032)$, though the practical significance . . .

`^` and `_` produce superscripts and subscripts respectively, and fractions can be typeset with `$\frac{Numerator}{Denominator}$`. Three quarters is `$\frac{3}{4}$`: $\frac{3}{4}$ and square roots are `$\sqrt{16}$`: $\sqrt{16}$. Special characters can be created with diacritics: `$\bar{X}$` produces $\bar{X}$ and `$\hat{Y}$` produces $\hat{Y}$.

Summation notation is available with the `$\sum$` command which produces the Greek letter $\sum$. The `\limits` command places upper and lower limits. The lower limit of summation is defined with a subscript and the upper limit of summation is defined with a superscript: `$\sum \limits_{i=1}^{n}$` produces $\sum\limits_{i=1}^{n}$.

Additional elements can be added: `$\sum \limits_{i=1}^{n} x_i = x_1 + x_2 + x_3 \ldots x_n$`. This produces:

$$\sum_{i=1}^{n} x_i = x_1 + x_2 + x_3 \ldots x_n$$

Some common mathematical symbols and the commands to produce them are shown in Table 19. LaTeX comes with Greek letters in upper and lowercase fonts. It provides all the lower-case letters and some of the upper-case letters. Pakin (2024) recommends that upper case Latin glyphs be used for the missing Greek upper-case letters. A list of these and their commands are in Table 20. These glyphs are designed for mathematics. If Greek is required for the body of a text, please use an alternative font with a full set of glyphs.

Both `equation` and `displaymath` environments print one-line equations. The difference between them is that formulae set with `equation` are numbered:

```
\begin{equation}
\bar{X} = \frac{\Sigma X}{n}
\end{equation}
```

$a \times b + c - d \div e$	`a \times b + c - d \div e`
$a < b > c$	`a < b > c`
$a^2 + b^2 = c^2$	`a^2 + b^2 = c^2`
$y - y_1 = m(x - x_1)$	`y - y_1 = m(x - x_1)`
f'	`f'`
$n!$	`n!`
$\frac{a}{b}$	`\frac{a}{b}`
$\binom{a}{b}$	`a \choose b`
$\sqrt{a}$	`\sqrt a`
$\sqrt[n]{a}$	`\root n \of {a}`
$\overbrace{abc}$	`\overbrace{abc}`
$\underbrace{abc}$	`\underbrace{abc}`
$\sum$	`\sum`
$\sum\limits_{i=0}^{\infty}$	`\sum \limits _{i=0}{\infty}`

Table 19: Some common mathematical symbols

Γ	`\Gamma`	Δ	`\Delta`	Θ	`\Theta`	Λ	`\Lambda`	Ξ	`\Xi`
Π	`\Pi`	Σ	`\Sigma`	Υ	`\Upsilon`	Φ	`\Phi`	Ψ	`\Psi`
Ω	`\Omega`								
α	`\alpha`	β	`\beta`	γ	`\gamma`	δ	`\delta`	ϵ	`\epsilon`
ζ	`\zeta`	η	`\eta`	θ	`\theta`	ι	`\iota`	κ	`\kappa`
λ	`\lambda`	μ	`\mu`	ν	`\nu`	ξ	`\xi`	π	`\pi`
ρ	`\rho`	σ	`\sigma`	τ	`\tau`	υ	`\upsilon`	ϕ	`\phi`
χ	`\chi`	ψ	`\psi`	ω	`\omega`				

Table 20: Upper and lowercase Greek letters

$$\bar{X} = \frac{\Sigma X}{n} \tag{1}$$

```
\begin{displaymath}
\bar{X} = \frac{\Sigma X}{n}
\end{displaymath}
```

$$\bar{X} = \frac{\Sigma X}{n}$$

This is a very short preview of LaTeX's mathematical capabilities. It has extensive facilities for matrices and functions and symbols and diacritics. For documentation on mathematics and symbols in LaTeX, see Berry (2024) and for a comprehensive list of symbols, see Pakin (2024).

8 Front Matter

8.1 Title Pages

Title pages are defined in the final part of the preamble with `\title{}`, `\author{}` and `\date{}`. The current date can be placed inside `\date{}` with `\today`, or a date can be entered manually. The title page is created with `\maketitle` which follows `\begin{document}`:

```
\documentclass[a4paper]{article}

\title{The Lost Secrets of \LaTeXe}
\author{Albertus Magnus}
\date{\today}

\begin{document}
\maketitle

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus . . .

\end{document}
```

8.2 The Abstract

Abstracts are contained in the abstract environment:

```
\begin{abstract}

Lorem ipsum dolor sit amet . . .

\end{abstract}
```

The abstract can appear on the title page or on a page of its own by inserting pagebreaks following `\maketitle` and after the end of the abstract environment. This example places the abstract on a page of its own after the title page:

```
\documentclass[a4paper]{article}

\title{The Lost Secrets of \LaTeXe}
\author{Albertus Magnus}
\date{\today}

\begin{document}
\maketitle
\clearpage
\begin{abstract}
\Lorem ipsum dolor sit amet . . .
\end{abstract}
```

```
\clearpage

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus . . .

\end{document}
```

8.3 Table of Contents, List of Figures and List of Tables.

The Table of Contents, List of Figures and List of Tables are inserted with:

```
\tableofcontents

\listoffigures

\listoftables
```

These are placed in the document environment after `\maketitle` and the abstract.

LaTeX will generate these automatically when the document is compiled from the sectioning commands and the figure and table captions. A page break after each command will place them on separate pages.

It is possible to have the front matter numbered in Roman numerals and the body of the text in arabic numerals. Page numbering may be changed with the `\pagenumbering` command.

The following creates a document with a title page containing the title and abstract, a Table of Contents, List of Figures and List of Tables. These are placed on separate pages and numbered in Roman numerals, with the body of the text in Arabic numerals. It is double spaced with a ragged right margin. Page breaks are specified with `\clearpage`:

```
\documentclass[a4paper]{article}

\title{The Lost Secrets of \LaTeXe}
\author{Albertus Magnus}
\date{\today}

\begin{document}

\maketitle
\doublespacing

\begin{abstract}

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus . . .
```

```
\end{abstract}
\thispagestyle{empty}
\clearpage

\pagenumbering{roman}

\tableofcontents
\clearpage

\listoffigures
\clearpage

\listoftables
\clearpage

\pagenumbering{arabic}

\begin{document}
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor
rhoncus . . .
\end{document}
```

9 End Matter

9.1 References

Referencing is a fundamental requirement of scholarly writing. A reference list allows readers to verify sources, gives information about the type of source, and allows readers to locate them. In LaTeX, these may be placed in the text manually or generated automatically.

9.1.1 Ye Olde Fashioned Way

References and citations can be inserted into a document manually. A reference list can be added in the appropriate place in the document with `\section{title}` command, and the references listed below this. Oxford style footnotes can be created by placing `\footnote{Your Text}` at the appropriate location in the text. When the document is compiled, the location is numbered with a superscript, and `Your Text` appears at the bottom of the page. Doing this by hand can be quite laborious and painstaking but it has the advantage that it will match any style requirement.

9.1.2 Automatically Generated References: BibLaTeX

LaTeX has facilities to generate references and reference lists automatically. BibLaTeX is a modern package for managing references and a wide range of packages with reference styles are available for it from CTAN. BibLaTeX requires that several packages be present on your LaTeX installation. These are listed in the Required Packages table above.

The first step in using LaTeX's automated reference system is to create a reference database for the project. This contains a list of primary, secondary, and tertiary sources used in the document. It is saved in `.bib` format and is located in the project directory so that LaTeX can find it when the document is compiled. Entrys have varying requirements. Database entrys for books require the name/s of the authors, the title, publisher, year of publication, publisher and publishers' address. Articles require authors, title, journal name, year, volume and pages. See BibLaTeX's documentation for specific requirements for each type of reference.

All bibliographical entries require a unique key. LaTeX uses these to match entries in the text with each reference. The type of reference and it's unique key are contained in the first line of the item's database entry. The key can be anything, but the first author's surname and year of publication, such as `Paper10`, is memorable. If the database contains more than one publication by the same author(s) in the same year, they can be uniquely identified by adding a letter: Paper10a, Paper10b, Paper10c.

It is possible to edit this file manually with a plain text editor if required, though there are a number of reference managers that simplify this process. The section above on Additional Software has several suggestions. A sample database containing an entry for a book and an article is below. These files should be saved in `.bib` format.

```
@book{Paper10,
```

```
author = {A Paper and F Pen and B L K Ink},
title = {Our Book},
publisher = {First Authors Press},
year = {2010},
address = {Booktown}
}

@article{Kliker12,
author = {G Kliker and L Flash},
title = {Photographing Critics},
Journal = {The Journal of Critical Photography},
Year = {2012},
Volume = {12},
pages = {50-60}
}
```

Table 21 contains a list of reference types supported by BibLaTeX.

LaTeX Reference Types
article
book
booklet
conference
inbook
incollection
inproceedings
manual
mastersthesis
misc
phdthesis
proceedings
techreport
unpublished

Table 21: Reference types supported by BibLaTeX

Citations are placed in the text with `\cite{}` or `\parencite{}` with the reference key placed between curly braces. `\cite{Kliker12}` produces a reference that is something like Kliker and Flash (2012). `\parencite{Kliker12}` produces a citation in parentheses (Kliker and Flash, 2012).

```
Lorem ipsum dolor sit amet, \cite{Kliker12} consectetur adipiscing elit.
Nulla est purus, ultrices in porttitor in, accumsan non quam. Nam
consectetur porttitor rhoncus. Curabitur eu est et leo feugiat auctor vel
quis lorem. Ut et ligula dolor, sit amet consequat lorem
\parencite{Kliker12}.
```

produces

Lorem ipsum dolor sit amet, Kliker and Flash (2012) consectetur adipiscing elit. Nulla est purus, ultrices in porttitor in, accumsan non quam. Nam consectetur porttitor rhoncus. Curabitur eu est et leo feugiat auctor vel quis lorem. Ut et ligula dolor, sit amet consequat lorem (Kliker and Flash, 2012).

A short list of common referencing styles and their packages is listed in Table 22. Additional information on these styles including limitations and incompatibilities is available in each package's documentation.

Style	Package Name
American Psychological Association, 7th Edition	`biblatex-apa`
Chicago Manual of Style, 17th Edition	`biblatex-chicago`
MLA Handbook for Writers of Research Papers, 9th Edition	`biblatex-mla`
Vancouver Style	`vancouver`

Table 22: BibLaTeX citations styles

`biblatex` is loaded in the preamble along with the required citation style.

```
\usepackage[style=StyleName]{biblatex}
```

The `StyleName` `apa` loads the American Psychological Association, 7th Edition style. `vancouver` loads the Vancouver style and `mla` loads the MLA style. There is no need to use the entire package name.

The `biblatex-chicago` style package is an exception to this. This package is loaded in place of `biblatex`, and the format is defined in options. This can be any of BibLaTeX's standard formats: `numeric`, `alphabetic`, `authordate` and `authortitle`. The following loads `biblatex-chicago` with the `authordate` option:

```
\usepackage[authordate]{biblatex-chicago}
```

BibLaTeX requires that `babel` and `csquotes` are loaded before biblatex. Any other packages should be loaded automatically by LaTeX if they are required.

The reference database is loaded next with `\addbibresource{}`. This loads the reference database and requires only the name of the database.

The reference list is placed inside the document environment at the desired location in the text with `\printbibliography`.

An optional command is `\nocite{}`. This allows items that have not been explicitly referred to in the text, but are in the bibliographical database, to be included in the reference list. To include a specific item, it's unique key should be placed inside the curly brackets: `\nocite{ItemKey}`. To include all the items in the bibliography, use a `*: \nocite{*}`.

The code below loads `biblatex`, specifies the name of the reference database with `\addbibresource{DatabaseName.bib}` and places the reference list with all the references in the bibliography on a new page:

```
\documentclass[]{article}
 . . .
\usepackage{babel}
\usepackage{csquotes}
\usepackage[style=CitationStyle]{biblatex}
\addbibresource{DatabaseName.bib}
\begin{document}

Document Text.

\clearpage
\nocite{*}
\printbibliography
\end{document}
```

When documents with BibLaTeX citations are compiled, the citation processing package `biber` must also be run to process and sort the citations and reference list.

Referencing styles are regularly revised, new ones appear, and institutions and publications may have their own unique versions of these. If an automated referencing system is used, the documentation should be consulted for shortcomings and possible incompatibilities with style requirements.

9.2 Appendices

Appendices can be added to documents with the `appendix` package. This is loaded in the preamble with

```
\usepackage{appendix}
```

Options for this package are listed in Table 23.

The appendices themselves are placed inside the appendix environment and are sectioned in the same way as the document text. Insert a `\clearpage` before `\begin{appendices}` and before each section to place them on a new page.

```
\clearpage
\begin{appendices}
\clearpage
```

Option	Description
`toc`	Includes a title in the Table of Contents prior to listing the appendices
`page`	Places a title prior to the beginning of the appendices
`title`	Adds the name 'Appendix' to each appendix title
`titletoc`	Does the same to each appendix title in the Table of Contents
`header`	Does the same for each page header

Table 23: Options for package appendix

```
\section{Appendix 1}
\clearpage
\section{Appendix 2}
\end{appendices}
```

10 Presentations with Beamer

Beamer is a LaTeX package for producing presentations. It supports plain LaTeX and pdfLaTeX. A sample presentation script is in Appendix E.

As with all LaTeX documents, global parameters are defined in the preamble and the text is placed inside the document environment. Beamer is loaded in the preamble with `\documentclass` and the body of the presentation is placed in the document environment:

```
\documentclass{beamer}
\begin{document}

Document Text

\end{document}
```

The contents of each slide are placed in the frame environment:

```
\begin{document}

\begin{frame}
Text
\end{frame}

\end{document}
```

The simplest Beamer presentation is:

```
\documentclass{beamer}

\begin{document}

\begin{frame}
Text
\end{frame}

\end{document}
```

Slide titles may be defined with `\frametitle`:

```
\begin{frame}
\frametitle{Title Text}
Text
\end{frame}
```

Beamer frames can contain lists, tables, graphics etc. These are placed in Beamer presentations in the same way as other LaTeX documents.

A title slide with Author, Title, Subtitle, Institute and Date may be generated automatically. The details are placed in the preamble and the command `\titlepage` is placed in the first frame environment:

```
\documentclass{beamer}

% Title Page
\title{The Lost Secrets of \LaTeXe}
\subtitle{}
\author{Albertus Magnus}
\institute{University of Paris}
\date{\today}

\begin{document}

\begin{frame}
\titlepage
\end{frame}

\end{document}
```

A logo can be added to either the title slide or all slides. `\titlegraphic` adds one to the title slide:

```
\titlegraphic{\includegraphics{graphicfilename}}
```

This places a graphic file on the bottom right of the title frame. `\logo` places a graphic file at the same location on each slide.

```
\logo{\includegraphics{graphicfilename}}
```

10.1 Overlays

Overlays refer to different states of the same slide. For instance a slide may contain a list with three points that may be revealed one at a time. This can be done by adding the `\pause` command after each item:

```
\begin{frame}
\frametitle{Lorem ipsum dolor sit amet}

\begin{itemize}
\item Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel,
 wisi.
\pause

\item Morbi auctor lorem non justo. Nam lacus libero, pretium at,
lobortis vitae, ultricies et, tellus.
\pause

\item Donec aliquet, tortor sed accumsan bibendum, erat ligula
aliquet magna, vitae ornare odio metus a mi.

\end{itemize}

\end{frame}
```

10.2 Handout generation

Handouts can be generated with the `\documentclassbeamer` handout option:

```
\documentclass[handout]{beamer}
```

This will create a handout with one slide per page. If handouts are generated, the LaTeX code should be in a separate directory from the main presentation code because the output will be over written.

11 Compiling Documents

When the text is marked up, it must be compiled to produce a readable document. LaTeX can produce postscript and PDF files. Both of these

11.1 Postscript Format

Postscript is the 'gold standard' for printed documents and LaTeX produces these without any special commands in the preamble. These files are compiled by running LaTeX multiple times to resolve the front and back matter, tables and lists. If the document contains references created with BibLaTeX, `biber` will have to be run to sort them. The following scheme is suggested for documents that contain BibLaTeX references. `biber` can be omitted if they are not present.

```
latex
biber
latex
latex
```

This can be done through the command line or an editor's GUI interface. To do this in TeXstudio, go to the Menu:

`Tools` → `Commands` → `LaTeX`

In Kile:

`Build` → `Compile` → `LaTeX`

If the document contains BibLaTeX references, `biber` is in the same menu.

This creates a Device Independent (`.dvi`) file. This intermediate file is then converted to postscript. In TeXstudio:

`Tools` → `Commands` → `DVI->PS`

In Kile:

`Build` → `Convert` → `DVItoPS`

LaTeX is run from the command line by navigating to the project folder and then run on a marked-up text file. These have a `.tex` extension. To run it on a file named `TestFile.tex`:

```
latex TestFile.tex
```

This too should be run multiple times, along with biber if required. It also produces a DVI file called `TestFile.dvi` that can be converted to postscript with `dvips`:

```
dvips TestFile.dvi
```

LaTeX saves the resulting files to the project directory. `dvi` files can be viewed with DVIOUT, which comes with TeX Live. Click on the `dvi` file to activate it. There isn't a reliable postscript viewer available at the moment, so it may be worth generating a pdf copy for editorial purposes. These may also be generated from the dvi file with

```
pdflatex TestFile.dvi
```

11.2 PDF Format

`.dvi` and postscript files can be converted to PDF format if required using the `DVI->PDF` or `PS->PDF` options in TeXstudio or the `DVItoPDF` or `PStoPDF` options in Kile. `pdf` files created this way will not contain any hyperlinks and there will be no metadata attached to the file. pdfLaTeX supports these features so is the recommended way to produce PDF files.

The file metadata can be included with `\hypersetup{pdfinfo={ . . .}}`. This contains information regarding the title, author, subject, creation date, modification date and keywords. It can be seen by accessing the document's properties. The following code provides title, author, subject and keywords.

```
\hypersetup{pdfinfo={
Title={The Lost Secrets of LaTeX2e},
Author={Albertus Magnus},
Subject={LaTeX2e},
Keywords={PDF; Latex2e; Guide}
}}
```

As with postscript documents, pdfLaTeX needs to be run multiple times to produce a finished document. This is to resolve the index, lists of tables and figures, hyperlinks, etc. If the document contains automatically generated references, biber will also need to be run. The following compiles a document that contains automatically generated references:

```
PDFlatex
  biber
PDFlatex
PDFlatex
```

To compile a document from the command line in PDF format, use `pdflatex`:

```
pdflatex TestFile.tex
```

To compile a document into PDF format in TeXstudio, go to the Menu:

`Tools` → `Commands` → `PDFLaTeX`

In Kile:

`Build` → `Compile` → `PDFLaTeX`

If the document contains BibLaTeX references, `biber` is in the same menu in both editors.

An additional step with PDF documents is to embed the fonts used in the document. This means that a copy of the fonts used in the document are included with the file. This is so the document looks the same across devices that may or may not have the same fonts as the document installed on them. LaTeX requires no additional steps to do this. Both the dvi or Postscript → PDF and pdfLaTeX do this automatically. To check that the fonts actually have been embedded, in Sumatra click on

Home → File → Properties

When the Document Properties box pops up, click on the `Get Fonts info`. This will contain a list of fonts. Look for the comment (Type 1; embedded) next to each font in the document. Most PDF viewers will have the same information in their equivalent 'Document Properties' sections.

12 References

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Appendix A Some Additional LaTeX 2ε Facilities

LaTeX has a much wider range of functionality than described in this document. Some add-on packages enhance existing facilities and others support music, presentations, and line drawings. Some of these are described in this Appendix.

Languages LaTeX has facilities for a wide range of modern languages and supports non-latin alphabets, such as Cyrrilic, and Logosyllabary, Syllabary, Abjad and Abugida writing systems. It also supports a range of extinct languages such as Phonecian, Egyptian Hieroglyphics, Linear B and Runic and provides symbols for the phonetic alphabet.

Line Drawings: PSTricks PSTricks creates line drawings. It can draw mathematical functions, diagrams, and pictures. It creates postscript output, but it is possible to create PDF output with the `pdftricks` package.

Mathematics: AMS-LaTeX AMS Maths is a production of the American Mathematical Society. It provides a range of enhanced mathematical facilities including substitutes for LaTeX's standard document classes.

Music A range of LaTeX packages support music. It can produce sheet music and sections of scores can be inserted into texts with `musixtex`. Songbooks can be created with the `songs` or `songbook` packages, `guitar`, `guitarchordschemes` and `guitartabs` support the guitar, `bagpipe` supports bagpipe music and gregorian chant is possible with `gregoriotex`.

Appendix B Resources

There are many resources for LaTeX. A short list of helpful texts along with documentation for the packages used in this document are in the reference list. In addition to this, there are significant online resources that are regularly updated.

The Comprehensive TEXArchive Network This is the home of LATEX 2_ε and contains distributions, additional packages, and documentation. The 'Starting out with TEX, LATEX, and friends' page is a good place to start.

www.ctan.org/starter

The TeX Users Group The TEXUsers Group (TUG) is a not-for-profit group interested in TEX. Their website has an informative page for those new to LaTeX: 'Getting started with TeX, LaTeX, and friends'. This contains information on installing TeX and LaTeX, links to documentation and sample documents.

http://tug.org/begin.html

The TEXfaq The TEXfaq addresses questions about TEXwith informative answers on a wide variety of topics.

http://texfaq.org

Appendix C A Sample Script for a Postscript Document

```
% Document Type, text point size and paper size
\documentclass[12pt, a4paper]{article}

% Enhanced tables
\usepackage{booktabs}
\usepackage{multirow}

% Line Spacing
\usepackage{setspace}

% Graphic management with the dvips backend
\usepackage[dvips]{graphicx}

% Colour support with  the dvipsnames colour palette
\usepackage[dvipsnames]{xcolor}

% Hyphenation for French, German and Australian English
\usepackage[french, ngerman, australian]{babel}
\usepackage{hyphenat}
% A list of words that LaTeX didn't hyphenate properly
\hyphenation{}

% Date formatting in Australian format
\usepackage[useregional, showdow]{datetime2}

% Font and encoding. This loads T1 and TS1 encodings, the Latin Modern
% font and a ragged right edge for the text block
\usepackage[TS1, T1]{fontenc}
\usepackage[document]{ragged2e}
\usepackage{lmodern}

% Page margins in inches with the geometry package
\usepackage[left=1.5in, right=1.0in, top=1.0in, bottom=1.75in,
headheight=18pt]{geometry}

% Headers and footers with a running header, page numbering and a
% left footer containing the date.
\usepackage{fancyhdr}
\pagestyle{fancy}
\lhead{Running Header or Title.}
\chead{}
\rhead{\thepage}
\lfoot{\today}
\cfoot{}
\rfoot{}
\renewcommand{\headrulewidth}{0.5pt}
```

```
\renewcommand{\footrulewidth}{0.5pt}

% The document title
\title{The Lost Secrets of \LaTeXe}
% The author(s)
\author{Albertus Magnus \\
     Doctor Universalis\\
        University of Paris \\}

% Insert today's date
\date{\today}


% The end of the preamble and the beginning of the document
\begin{document}

% Create the title and abstract on the front page with no headers,
% footers or page numbers.
\maketitle
\thispagestyle{empty}

% Insert an abstract
\begin{abstract}
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.
\end{abstract}

% Create a new page for the Table of Contents and begin numbering the
% pages in lower case Roman numerals for the front matter.
\clearpage
\pagenumbering{roman}
\tableofcontents

% Create a new page for the List of Figures
\clearpage
\listoffigures

% Create a new page for the List of Tables
\clearpage
\listoftables

% Create a new page to begin the text of the document and begin
% numbering thepages in Arabic numerals.
\clearpage
\pagenumbering{arabic}

% Define line spacing
```

```
\doublespacing


% Document text with sections, a hot link at the end of the first
% section, a numbered list and a table.

\section{Integer sapien est}

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.

% Insert a numbered list

\begin{enumerate}
\item Mauris ut est
\item Ut quis purus
\item Sed ac odio
\item Sed vehicula hendrerit sem
\item Duis non odio
\end{enumerate}

\subsection{Phasellus adipiscing semper elit}

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 tincidunt urna.
Nulla ullamcorper vestibulum 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 elit. 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 lorem. Sed lacinia 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.

Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae
lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetuer
adipiscing elit. In hac habitasse platea dictumst. Integer tempus
convallis augue. Etiam facilisis. Nunc elementum fermentum wisi.
Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis
odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae
tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae
risus porta vehicula.

% Insert a table
\begin{table}[h]
\begin{center}
\begin{tabular}{cll}
\toprule[1.0pt]
1 & Fusce mauris & Vestibulum luctus nibh at lectus \\
2 & Vestibulum diam & Aliquam pellentesque, augue quis sagittis \\
3 & Vestibulum porttitor & Nulla facilisi \\
4 & Morbi fringilla, wisi & In dignissim interdum, justo lectus \\
5 & Cras ac magna & Cras nulla \\
\bottomrule[1.0pt]
\end{tabular}
\caption{Caption text}
\end{center}
\end{table}

% End of the text and the document.

\end{document}
```

Appendix D A Sample Script for a PDF Document

```
% Document Type
\documentclass[12pt, a4paper]{article}

% Line Spacing
\usepackage{setspace}

% Enhanced tables
\usepackage{booktabs}
\usepackage{multirow}

% Graphic management with the pdftex backend
\usepackage[pdftex]{graphicx}

% Colour support with  the dvipsnames colour palette
\usepackage[dvipsnames]{xcolor}

% Hyphenation for French, German and Australian English
\usepackage[french, ngerman, australian]{babel}
\usepackage{hyphenat}
\hyphenation{}

% Date formatting in Australian format
\usepackage[useregional, showdow]{datetime2}

% Font and encoding. This loads T1 and TS1 encodings, the Latin Modern
% font and a ragged right edge for the text block
\usepackage[TS1, T1]{fontenc}
\usepackage[document]{ragged2e}
\usepackage{lmodern}

% Page margins with the geometry package
\usepackage[left=1.5in, right=1.0in, top=1.0in, bottom=1.75in,
headheight=18pt]{geometry}

% Headers and footers with a running header, page numbering and a
% left footer containing the date.
\usepackage{fancyhdr}
\pagestyle{fancy}
\lhead{Running Header or Title.}
\chead{}
\rhead{\thepage}
\lfoot{\today}
\cfoot{}
\rfoot{}
\renewcommand{\headrulewidth}{0.5pt}
\renewcommand{\footrulewidth}{0.5pt}

% The document title
```

```
\title{The Lost Secrets of \LaTeXe}
% The author(s)
\author{Albertus Magnus \\
     Doctor Universalis \\
        University of Paris \\}

% Insert today's date
\date{\today}

% Load hyperref to allow hotlinks in the document. These options load
% the pdf backend and set all links to the colour blue
\usepackage[pdftex, colorlinks=true, allcolors=Blue]{hyperref}

% Metadata for the PDF file: Title, Author, Subject and Keywords

\hypersetup{pdfinfo={
Title={The Lost Secrets of LaTeXe},
Author={Albertus Magnus},
Subject={LaTeX2e},
Keywords={Latex2e; Guide}
}}


% The end of the preamble and the beginning of the document
\begin{document}

% Create the title and abstract on the front page with no headers,
% footers or page numbers.
\maketitle
\thispagestyle{empty}

% Insert an abstract
\begin{abstract}
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.
\end{abstract}

% Create a new page for the Table of Contents and begin numbering the
% pages in lower case Roman numerals for the front matter.
\clearpage
\pagenumbering{roman}
\tableofcontents

% Create a new page for the List of Figures
\clearpage
\listoffigures
```

```
% Create a new page for the List of Tables
\clearpage
\listoftables

% Create a new page to begin the text of the document and begin numbering
% thepages in Arabic numerals.
\clearpage
\pagenumbering{arabic}

% Define line spacing
\doublespacing


% Document text with sections, a numbered list, a table and a hot link
% at the end of the first section.

\section{Integer sapien est}
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. \url{www.ctan.org}


% Insert a numbered list

\begin{enumerate}
\item Mauris ut est
\item Ut quis purus
\item Sed ac odio
\item Sed vehicula hendrerit sem
\item Duis non odio
\end{enumerate}

\subsection{Phasellus adipiscing semper elit}
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 tincidunt urna.
```

Nulla ullamcorper vestibulum 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 elit. 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 lorem. Sed lacinia 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.

Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

```
% Insert a table
\begin{table}[h]
\begin{center}
\begin{tabular}{cll}
\toprule[1.0pt]
1 & Fusce mauris & Vestibulum luctus nibh at lectus \\
2 & Vestibulum diam & Aliquam pellentesque, augue quis sagittis \\
3 & Vestibulum porttitor & Nulla facilisi \\
4 & Morbi fringilla, wisi & In dignissim interdum, justo lectus \\
5 & Cras ac magna & Cras nulla \\
\bottomrule[1.0pt]
\end{tabular}
\caption{Caption text}
\end{center}
\end{table}

% End of the text and the document.

\end{document}
```

Appendix E A Sample Script for a Beamer Presentation

```
\documentclass{beamer}

\usetheme{Berlin}

% Title Page
\title{The Lost Secrets of \LaTeXe}
\author{Albertus Magnus}
\institute{\textit{Universit\'{e} de Paris}}
\date{\today}

\titlegraphic{
\includegraphics[scale=0.2]{drawing.eps}
}

\begin{document}

\begin{frame}
\titlepage
\end{frame}


\begin{frame}

\frametitle{Morbi ac orci et nisl hendrerit mollis}

\begin{enumerate}
\item Suspendisse ut massa. Cras nec ante. Pellentesque a nulla.
\item Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis.
Pellentesque cursus luctus mauris.
\item Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum.
\end{enumerate}

\end{frame}


\begin{frame}
\frametitle{Lorem ipsum dolor sit amet}

\begin{itemize}
\item Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel,
 wisi.
\pause

\item Morbi auctor lorem non justo. Nam lacus libero, pretium at,
lobortis vitae, ultricies et, tellus.
```

```
\pause

\item Donec aliquet, tortor sed accumsan bibendum, erat ligula
aliquet magna, vitae ornare odio metus a mi.

\end{itemize}

\end{frame}



\end{document}
```

Appendix F GNU Free Documentation License

Preamble

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