

Yet Another Guide to $\text{\LaTeX 2}_{\epsilon}$ v0.5

Michael P. Morris ^{*}
`mmorris-500@hotmail.com`

Abstract

This document is a short guide to using $\text{\LaTeX 2}_{\epsilon}$ to typeset high quality documents. It focuses on users of Windows 10 OS and guides the reader through installation, some of $\text{\LaTeX 2}_{\epsilon}$'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 and is freely available from the Comprehensive TeX Archive Network (CTAN) at www.ctan.org. Since its release it has been greatly added to, and as of this writing there are currently over 6100 add-on packages from over 2800 contributors. The most recent version is L^AT_EX 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 the possibilities. The best source of information is package documentation which is available from CTAN. There are also a number of published guides and the reference list contains several useful references. A more comprehensive list, and a helpful list of texts on typography is also available from CTAN.

This document focuses on the Windows 10 operating system. Users of UNIX-alike or Mac systems should consult their OS 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.

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 also with changes to TeX distributions.

A previous version of this document was titled 'Getting Started with L^AT_EX 2_ε'. The name has been changed as it was very similar to other documents relating to LaTeX. This version contains corrections, clarifications and some additions. This document was produced with ProT_EX v3.2-031721, the most recent version available at the time of this writing.

The author is very interested in hearing about errors and suggestions for improvements, especially code that doesn't function as advertised. These reports can be sent to the author at mmorris-500@hotmail.com.

2 Installation

L^AT_EX 2_ε is freely available from www.ctan.org in three main distributions:

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

The most current version of ProTeX, as of this writing, is `protext-3.2-031721`. To install this on a Windows system, download it from CTAN and unzip it. This will create a new directory called `protext-3.2-031721`. Click on this, then `setup.exe`. This will bring up the global setup console. Click `manual` to bring up a PDF document with easy installation instructions. The distribution also contains TeXstudio, an editor, and Sumatra, a PDF viewer in their respective directories. These should be installed after LaTeX. The `doc` directory contains several manuals on using LaTeX.

After ProTeX is installed, the next step for Windows 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 →
Edit

Then navigate to the directory containing the binary files and add it to the path. If it is a ProTeX distribution running on 64 bit Windows 10 they are in:

`C:\Program Files\MikTeX2.9\miktex\bin \x64`

2.1 Package Management

CTAN currently has over 6100 packages for LaTeX from over 2800 contributors. These provide additional features, fonts, document templates and documentation. ProTeX provides the MiKTeX Console to help manage them. This provides facilities for updating packages, accessing package documentation and installing new packages. UNIX-alike and MacTeX users should consult their documentation.

The MikTeX Console can be accessed from the Windows 10 desktop by clicking

Windows Start → MiKTeX 2.9 → MiKTeX Console

When the Console appears, select the Operation Mode: **Administrator** or **User**. Select **Administrator** if you want to manage a system wide installation, such as on a single workstation, or **User** if you are working on a workstation which is part of a larger system.

To add packages to LaTeX, click **Packages** and a list of all the packages available from CTAN will appear along with the date it was installed on your system. If the date is missing, the package is not present on your installation. To install it, click the package name so that it is highlighted, then click + at the top of the list to install it.

To update currently installed packages, select

Updates → Check for updates

If any updates are found, they will appear as a list. To perform the update, click **Update now** and they will be downloaded and installed automatically.

Following the package installation or update the file name and package databases have to be updated so that LaTeX can find the updated packages. If new fonts have been installed, the font map files have to be refreshed. To do this, go to the console Menu, click on

Tasks → Refresh file name database

When this is finished, go to

Tasks → Update package database

If fonts have been updated or installed, select

Tasks → Refresh font map files

Package documentation can be accessed by clicking **Documentation** on the console. A list of all the packages on **ctan** will appear along with a tick in the **Installed** column if it is present on the system. Documentation may be installed in the same way as packages.

A number of packages must be present on your installation so that you can use the examples in this document. Not all of them come with every distribution due to size constraints. The ProTeX distribution's download size had grown to about 3gb, and to reduce this, a number of packages were omitted. This reduced the download size to about 1gb. If any of the required packages are missing, they can be installed using the instructions in the section on Package Management below. Some packages access other packages and these must be present on your installation as well: **ragged2e**, for instance, requires the packages **everysel** and **footmisc**. BibLaTeX, which automatically generates references and reference lists, has 12 additional packages, not including style packages! A list is in Table 1.

2.2 Additional Software

The software listed below is helpful for managing projects in LaTeX. An editor makes marking up a text file and compiling it much simpler. Two freely available editors are T_EXstudio and Kile. T_EXstudio comes with ProTeX and the most recent version is available from:

www.texstudio.org

$\text{\LaTeX 2}_{\epsilon}$	Bib \LaTeX
babel	babel v3.9r or above or polyglossia
datettime2	biber
everyysel	csquotes
fancyhdr	etoolbox
fontenc	etex
footmisc	ifthen
geometry	keyval
graphicx	kvoptions
hyphenat	logreq
ragged2e	pdftexcmds v0.27 or above
setspace	url
xcolor	xpatch
xmp	
	Bibliographical Styles
	biblatex-apa
	biblatex-chicago
	biblatex-mla
	biblatex-vancouver

Table 1: Required and recommended packages

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

www.kile.sourceforge.io/

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 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 also add annotations to each entry:

www.zotero.org

A fundamental requirement for LaTeX is a viewer so that typesetters can view the results of their labours. There are a large number of viewers for PDF files, and ProTeX comes with Sumatra PDF. The latest version is available from:

www.sumatrapdfreader.org/free-pdf-reader

GSView is a free postscript viewer for Windows. It requires Ghostscript which is installed automatically by ProTeX. GSview v5.0 is available from:

www.ghostgum.com.au/software/gsview.htm

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. It is available from:

www.imagemagick.org/script/index.php

3 Running L^AT_EX 2_ε

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 produces a DVI file called `TestFile.dvi` that can be converted to postscript with `dvips`:

```
dvips TestFile.dvi
```

If PDF format is preferred, use `PDFLATeX`:

```
pdflatex TestFile.tex
```

It is convenient to run this from a GUI interface. In TeXstudio, load a marked-up text file then go to

`Tools` → `Commands` → `LaTeX` or `PDFLaTeX`

and it will run automatically. In Kile, go to

`Build` → `Compile` → `LaTeX` or `PDFLaTeX`

4 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 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.

4.1 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. Postscript documents require no specific instructions. PDF files have options for file metadata and hyperlinks and these require PDFLaTeX. See the section on PDF document compilation below for how to include these in your document.

5 LaTeX Conventions

LaTeX documents have two parts: the preamble and the document text. The preamble defines the document's global properties such as the template for the document, paper size, fonts and margins and loads packages that contain functions that will be used to format the text. The first command is `\documentclass{TemplateName}`. Packages are loaded with the `\usepackage[Options]{PackageName}` command. The required package name is placed between the curly braces and a list of options separated by commas are listed between square brackets:

```
\documentclass{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}
```

5.1 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: A `$` is one of LaTeX's control characters, so a `\` must be added to tell LaTeX that it should be processed as text: `\$` produces `$`. Commands for all of LaTeX's control characters is 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.
```

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

Table 2: Document class options

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

Table 3: Paper sizes

6 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.

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 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, 2021). 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. There may be multiple options for 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:

```
\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 `\selectlanguage{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 Francais.
\selectlanguage{australian}
Returns to Australian English.
```

or

```
\foreignlanguage{french}{Texte en Francais.}
```

If LaTeX doesn't hyphenate words properly, they will run into the right-hand margin. To fix this, a list of troublesome words and their syllables can be specified with the `hyphenat` package and its `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`. Multiple words are separated by commas:

```
\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 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}
```

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

Table 4: A short font sampler

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 loads the font for the document. 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. A wide range of fonts is available. The TeX User Group maintains the LaTeX font catalogue. See the Resources section for a link to this.

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 $1.5\times$ 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:

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


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

Table 5: Geometry options

The page margins can be changed mid-document with `\newgeometry{}`. It reverts to the original settings with `\restoregeometry`. 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:

```
\restoregeometry
```

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

```
\renewcommandheadrulewidth0.5pt
\renewcommandfootrulewidth0.5pt
```

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}
```

7 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}
```

Either 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, figures, or graphics. This will place them at the end of their section if LaTeX is unable to place them in the text.

7.1 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 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. Table 7 gives commands for resizing fonts.

If `xcolor` 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	<code>\textrm{}</code>	Roman
Sans Serif	<code>\textsf{}</code>	Sans Serif
Typewriter	<code>\texttt{}</code>	Typewriter
Italics	<code>\textit{}</code>	<i>Italics</i>
Boldface	<code>\textbf{}</code>	Boldface
Small Caps	<code>\textsc{}</code>	SMALL CAPS
Underline	<code>\underline{}</code>	<u>Underline</u>
Emphasis	<code>\emph{}</code>	<i>Emphasis</i>
Slanted	<code>\textsl{}</code>	<i>Slanted</i>

Table 6: Text styles

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

produces:

Lorem ipsum dolor sit amet Lorem ipsum dolor sit amet

7.2 Special Characters

The following symbols are used by LaTeX as part of its 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 or `\textquoteleft` and `\textquoteright`: ``Word'` produces ‘Word’. For double quotes, use two of each or `\textquotedblleft` and `\textquotedblright`: ```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’).

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 18,000 symbols. This list is freely available from CTAN. A link is provided in the Reference section.

Symbol	Command	Symbol	Command
{	\{	---	---or \textemdash
}	\}	`	\asciigrave
%	\%	'	\textasciiacute
&	\&	˘	\textasciibreve
\$	\\$ or \textdollar	•	\textbullet
_	_	◦	\textopenbullet
#	\#	...	\textellipsis
\	\textbackslash	*	\textasteriskcentered
~	\~{}	†	\textdagger
^	\^{}{}	‡	\textdaggerdbl
‘	\textquoteleft or `	¶	\textparagraph
’	\textquoteright or '	§	\textsection
“	\textquotedblleft or ``	~	\texttildelow
”	\textquotedblright or ''	~	\textasciitilde
--	--or \textendash	.	\textperiodcentered
£	\textsterling	€	\texteuro
¢	\textcent	¥	\textyen
°	\textdegree	°C	\textcelsius
©	\textcopyright	™	\texttrademark
×	\texttimes	÷	\textdiv
—	\textminus	>	\textgreater
<	\textless	©	\textcopyright

Table 8: Special characters and some common symbols

Diacritic	Code	Example
Acute	\`{}	á
Breve	\u{}	ă
Caron / Haček	\v{}	ǎ
Cedilla	\c{}	ç
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

7.3 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, 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’.

Name	Symbol	Command
Double Guillemot: Left	«	<code>\guillemetleft</code>
Double Guillemot: Right	»	<code>\guillemetright</code>
Single Guillemot: Left	<	<code>\guilsinglleft</code>
Single Guillemot: Right	>	<code>\guilsinglright</code>
Exclamation Down	¡	<code>\textexclamdown</code>
Question Mark Down	¿	<code>\textquestiondown</code>
Base quote: Double	„	<code>\quotedblbase</code>
Base Quote: Single	,	<code>\quotesinglbase</code>
Elipsis	...	<code>\textellipsis</code>

Table 11: Punctuation marks

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

Table 12: Environment options

8 Body

8.1 Sectioning

Sectioning is the division of a document into parts, chapters, sections, subsections, sub-subsections, 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 them automatically and the text of the `SectionTitle` will appear in the Table of Contents. The following creates two sections, each with two subsections:

```
\section{Section 1}
\subsection{1A}
\subsection{1B}
\section{Section 2}
\subsection{2A}
\subsection{2B}
```

8.2 Environments

Environments are used in the body of the document to define a particular behaviour. These range from abstracts, tables, and figures, lists and sections of text with differing justification. 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 the entered text 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 on your editor as

```
The first 100 digits of pi:
3.14159265358979323846264338327950288419716939937510582097494459
23078164062862089986280348253421170679
```

but when the document is compiled, it produces:

```
The first 100 digits of pi:
3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862
```

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 `\\` to signal the end of a line:

```
The first 100 digits of pi: \\
3.141592653589793238462643  \\
38327950288419716939937510  \\
58209749445923078164062862  \\
089986280348253421170679    \\
```

This produces:

```
The first 100 digits of pi:
3.141592653589793238462643
38327950288419716939937510
58209749445923078164062862
089986280348253421170679
```

8.3 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

8.4 Tables and Figures

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

8.4.1 Tables

Tables are placed within the `table` environment. A caption can be added with `\caption{Caption Text}` just before `\end{table}` so that it appears below the table. LaTeX numbers them automatically and the caption will appear in the List of Tables.

Tables consist of three nested environments: `table`, `table alignment` and `tabular`. After `\begin{table}`, comes the table's alignment on the page. This can be `centre`, `flushleft` or `flushright`. The table's contents and formatting instructions are contained in the `tabular` environment. Instructions relating to the number of columns, their alignment and if there are vertical lines separating the columns are on the same line as `\begin{tabular}` in curly braces. The alignment commands are `l` = left aligned, `c` = centred and `r` = right aligned. Vertical lines are added with a `|`. This key is located on the keyboard below `backspace`.

The code below shows the three nesting levels for a table with four columns with column 1 left aligned, columns two and three centred and column 4 right aligned. Vertical lines separate columns 1–2, 2–3 and 3–4.

```
\begin{table}
\begin{center}
\begin{tabular}l|c|c|r
. . . Table Contents . . .
\end{tabular}
\caption{Caption text}
\end{center}
\end{table}
```

The data for the table 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 horizontal lines above and below it with another horizontal line at the bottom of the table. These lines are added with `\hline`. Table 13 shows the compiled output.

Column 1	Column 2	Column 3	Column 4
Row 1	Text 2	Text 3	3.157
Row 2	Text 2	Text 3	14.930
Row 3	Text 2	Text 3	0.720

Table 13: Sample table

```

\begin{table}
\begin{center}
\begin{tabular}{l|c|c|r}
\hline
Column 1 & Column 2 & Column 3 & Column 4 \\
\hline
Row 1 & Text 2 & Text 3 & 3.157 \\
Row 2 & Text 2 & Text 3 & 14.930 \\
Row 3 & Text 2 & Text 3 & 0.720 \\
\hline
\end{tabular}
\caption{Example Table.}
\end{center}
\end{table}

```

8.4.2 Figures

The first step in importing graphic files is to place the file in the project directory so that LaTeX can find it. Graphics are placed within documents inside the `figure` environment. The placement of the figure on the page can be: `centre`, `flushleft` or `flushright`.

The code below loads a graphic file named `Drawing` 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. `\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.

```

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

```

produces:

LaTeX works with a quite limited range of graphic formats. Documents in postscript format can only contain graphics in postscript (`ps`) or encapsulated postscript (`eps`) formats. These are vector formats. Postscript is the ‘gold standard’ for printed documents but unfortunately, postscript only works with whole pages. `eps` works with graphics of

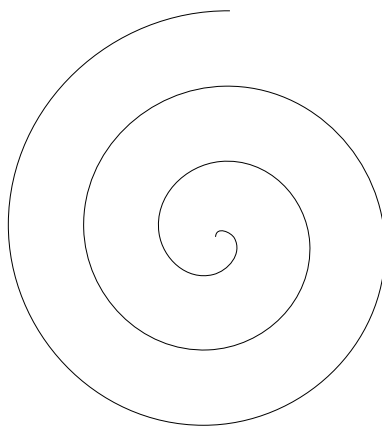


Figure 1: Spiral

any size so this is the preferred format for graphics that are smaller than this. Documents in PDF format created by PDFLaTeX can contain graphics in `pdf`, `png`, `jpeg` or `jbig2` formats. If the file is in a different format, it will have to be converted to one of these.

There are two types of graphic formats: vector and raster. Vector formats, such as postscript (`ps`), encapsulated postscript (`eps`) and Portable Document Format (`pdf`), 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 graphic. 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.

Raster graphics are made up of pixels. Each pixel has a value relating to its individual colour attached to it. 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 which lowers quality. Any image processing should be completed before they are inserted into a document and the image sized to the dimensions that it will be printed at.

If the document is to be printed professionally and it includes raster graphics, it is worth consulting the printers for their requirements. This may include specific file formats, resolution, which is often 300ppi, a colour space, often `cmyk` or `rgb`, and colour depth which may be restricted to 8bit.

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, f
Alph	Upper-case letters	A, B, C, D, E, F

Table 14: Page numbering options

8.5 Page Numbering

The default page numbering in LaTeX is Arabic numerals which begin on the first page. Table 14 shows the available styles:

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 main matter of the document 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{Anonymous}
\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.

9 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 an equation is set within text such as when you need to include mathematics, 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, ω² = 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 Σ . 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 $\sum_{i=1}^n$. Elements can be added with `$x_i = x_1 + x_2 + x_3 \ldots x_n$`. 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 15. 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 (2021) 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 16.

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}
```

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

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

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

Table 15: Some common mathematical symbols

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

Table 16: Upper and lowercase Greek letters

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

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 (2021) and for a comprehensive list of symbols, see Pakin (2021).

10 Front Matter

10.1 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{Herodotus}
\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}
```

10.2 The Abstract

Abstracts are created by 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{Herodotus}
\date{\today}
\begin{document}
\maketitle
\clearpage
\begin{abstract}
Lorem ipsum dolor sit amet . . .
\end{abstract}
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est
purus, ultrices in porttitor in, accumsan non quam. Nam consectetur
porttitor rhoncus . . .
\end{document}
```

10.3 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
```

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

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

11 End Matter

11.1 References

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

11.1.1 The Olde Fashioned Way

References can be inserted into a document manually for referencing systems such as MLA, Chicago, Vancouver, and APA styles. A reference list can be added in the appropriate place in the document with `\section{title}` command, and the references listed below this manually. Footnotes can be created by placing a `\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.

11.1.2 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. Not all of them may be present so it is worth checking. These are: `e-TeX`, `etoolbox`, `kvoptions`, `logreq`, `pdftexcmds` v0.27 or above, `keyval`, `ifthen`, `url`, `xpatch`. Recommended packages are `babel` v3.9r or above, or `polyglossia` and `csquotes`. These recommended packages provide facilities for languages other than American English and should be loaded before `biblatex`. `biber` is also required as this processes and sorts the reference list during the document's compilation.

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 in `.bib` format and is saved to the project directory so that LaTeX can find it when the document is compiled. LaTeX's format for entries for books and articles is this:

```
@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},
```

Reference 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 17: BibLaTeX citations styles

```

title = {Photographing Critics},
Journal = {The Journal of Critical Photography},
Year = {2012},
Volume = {12},
pages = {50-60}
}

```

The standard reference types are `article`, `book`, `booklet`, `conference`, `inbook`, `incollection`, `inproceedings`, `manual`, `mastersthesis`, `misc`, `phdthesis`, `proceedings`, `techreport` and `unpublished`. This list is saved in `.bib` format.

All bibliographical entries contain a unique key. This is contained in the first line. It can be anything, but the first author's surname and year of publication 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`. This key is used to identify specific entries in the bibliography for use as identifiers in the text when automatic citation generators are used.

A short list of common referencing styles and their packages is listed in Table 17. These can be installed if they are missing with LaTeX's Console. Additional information on these styles including limitations and incompatibilities is available in each package's documentation.

`biblatex` is loaded in the preamble along with the required citation style and the name of the reference database. Required packages that are not automatically loaded, such as `babel` and `csquotes`, should be loaded with `\usepackage` prior to `biblatex`. The required style is specified as an option in square brackets:

```
\usepackage[style=apa]biblatex
```

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 code below loads `biblatex`, specifies the name of the reference database with `\addbibresource{Databasename.bib}` and places the reference list on a new page:

```

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

```

Document Text.

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

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}
```

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, its unique key should be placed inside the curly brackets: `\nocite{ItemKey}`. To include all the items in the bibliography, use a `*`: `\nocite{*}`.

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).

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 versions of these. If an automated referencing system is used, the documentation should be consulted for shortcomings and possible incompatibilities with style requirements.

11.2 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 18:

The appendices themselves are placed inside the appendix environment and are sectioned in the same way as the document text:

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

To begin the appendices on a new page, and to place each new appendix on a new page, insert a page break before the appendix's environment and the beginning of a new appendix.

<code>toc</code>	Includes a title in the Table of Contents prior to listing the appendices
<code>page</code>	Places a title prior to the beginning of the appendices
<code>title</code>	Adds the name ‘Appendix’ to each appendix title
<code>titletoc</code>	Does the same to each appendix title in the Table of Contents
<code>header</code>	Does the same for each page header

Table 18: Options for package appendix

12 Compiling Documents

12.1 Postscript Format

When the text is marked up, it must be compiled to produce a readable document. LaTeX can produce postscript and PDF files. 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, and if the document contains references created through BibLaTeX, Biber will also have to be run to sort and resolve these. 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 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 → DVItO PS

LaTeX saves the resulting files to the project directory. `dvi` files can be viewed with YAP (Yet Another Previewer), which comes with ProTeX. Click on the `dvi` file to activate it. Postscript files can be viewed with GSView.

12.2 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 DVItO PDF or PStO PDF options in Kile. These 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.

Hypertext links can be inserted into PDF documents with the `hyperref` package. This automatically turns all internal references, such as the table of contents and lists of tables and figures, cross references, and citations into active hyperlinks. Clicking on the link will take you to the appropriate place in the text. This should be the last package loaded in the preamble.

By default, text with hyperlinks appear framed in a colour depending on the type of link: citations in green, URL's in magenta and links in red, etc. This can be changed to coloured text by adding the `colorlinks=true` option. As with the default colours, this has different colours for each type of link. The `allcolors` option changes all links to a single colour. This colour can be any in the `xcolor` option nominated when `xcolor` was loaded in the preamble. The following code loads `hyperref` with hyperlinks being flagged with text coloured blue:

```
\usepackage[pdftex, colorlinks=true, allcolours=blue]{hyperref}
```

It is worth specifying a backend driver for this package, in this case, `pdftex`. This helps configure `hyperref` to the compiler used for the document. In the case of PDF files, PDFLaTeX.

Links to external web pages can be created in the text with `\url{WebAddress}`. The following code will create a link to CTAN's homepage at www.ctan.org:

```
\url{www.ctan.org}
```

The file metadata can be edited 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 only title, author, subject and keywords. It omits the creation date and modification date, so PDFLaTeX will automatically fill these fields with the current date:

```
\hypersetup{pdfinfo={
Title={The Lost Secrets of LaTeX2e},
Author={Herodotus},
Subject={LaTeX2e},
Keywords={PDFD; Latex; Guide}
}}
```

The creation date and modification date fields can be specified if required. The format is `YYYYMMDDHHMMSS`: `YYYY` = year, `MM` = month, `HH` = hour, `MM` = minute and `SS` = second.

As with postscript documents, PDFLaTeX will have to be run multiple times to resolve the front and back matter, tables, hyperlinks, etc.

13 References

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<http://icmje.org/icmje-recommendations.pdf>

Appendix A Some Additional L^AT_EX 2_ε 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 outlined in this Appendix.

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

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

Beamer Beamer produces presentations. It is a document class that is loaded in the preamble. It is compatible with PDFLaTeX and can create slides and handouts in PDF and supports overlays and hyperlinks.

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.

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 T_EX Archive Network This is the home of L^AT_EX 2_ε and contains distributions, additional packages, and documentation. The ‘Starting out with T_EX, L^AT_EX, and friends’ page is a good place to start.

www.ctan.org/starter

The TeX Users Group The T_EX Users Group (TUG) is a not-for-profit group interested in T_EX. 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>

TUG also hosts the ‘L^AT_EX Font Catalogue’. This is a comprehensive list and sampler of freely available fonts for latin alphabets and documentation on how to use them.

<http://tug.org/FontCatalogue/>

The T_EXfaq The T_EXfaq addresses questions about T_EX with informative answers on a wide variety of topics.

<http://texfaq.org>

Appendix C A Sample Script for a Postscript Document

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

% Line Spacing
\usepackage{setspace}

% Graphic management
\usepackage{graphicx}

% Colour Support with a colour palette from dvipsnames
\usepackage[dvipsnames]{xcolor}

% Hyphenation
\usepackage[french, ngerman, australian]{babel}
\usepackage{hyphenat}
\hyphenation{}

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

% Font and encoding
\usepackage[TS1, T1]{fontenc}
\usepackage{lmodern}

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

% Headers and footers
\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{Herodotus}

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

% Write the abstract
\begin{abstract}
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus,
ultrices in port titor in, accumsan non quam. Nam consectetur porttitor
rhoncus. Curabitur eu est et leo feugiat auctor vel quis lorem.
\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
% Page Numbering
\pagenumbering{arabic}

% Beginning of the text.
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. Ut et
ligula dolor, sit amet consequat lorem. Aliquam porta eros sed velit
imperdiet egestas. Maecenas tempus eros ut diam ullamcorper id dictum
liberotempor. Donec quis augue quis magna condimentum lobortis. Quisque

```

imperdiet ipsum vel magna viverra rutrum. Cras viverra molestie urna,
vitae vestibulum turpis varius id.

Vestibulum mollis, arcu iaculis bibendum varius, velit sapien blandit
metus, ac posuere lorem nulla ac dolor. Maecenas urna elit, tincidunt in
dapibus nec, vehicula eu dui. Duis lacinia fringilla massa. Cum sociis
natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus.
Ut consequat ultricies est, non rhoncus mauris congue porta.

% End of the Text

\end{document}

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Version 1.2, November 2002

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