Introduction to Latex I

Basic Paper Format

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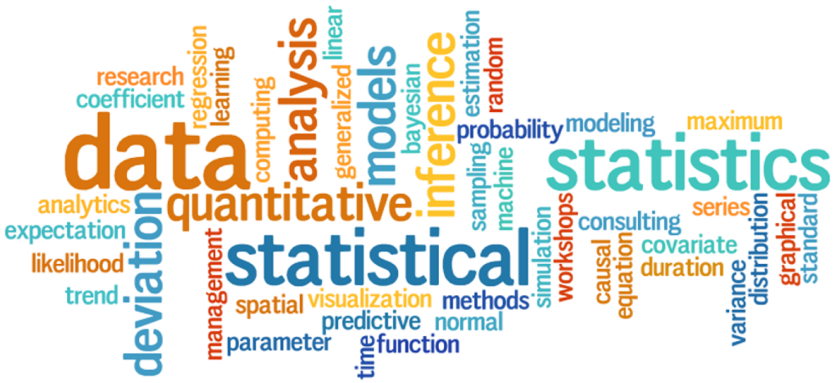

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LATEX

- LATEX is not a word processor, but is a formatter.
  - This means that you are preparing a file containing commands for LATEX using some LATEX editor and then use a LATEX program (such as TeXWorks) to convert it into printed documents.
  - Any LATEX file you make should have the extension ".tex"
- Uses LATEX commands (words which when LATEXed turn into symbols or directions) to do things like underline, center, etc.

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- Uses LATEX commands (words which when LATEXed turn into symbols or directions) to do things like underline, center, etc.
- Two Modes of text
  - text mode
    - default mode
    - most commands change the appearance and layout of the text on the page
  - math mode
    - usually indicated by a dollar sign
    - used to create math symbols and other math commands

Advantages/Disadvantages

Advantages

- It's fine control over document structure and formatting makes it a powerful - and formidable - tool.
- You don't need to manually adjust fonts, text sizes, line heights, etc.
- Mathematical formulas are easy to typeset
- The layout, fonts, tables, etc. are consistent throughout the document
- Adding footnotes, citations and references is easy

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Disadvantages

- You don't see the final version of the document while editing it
- It can sometimes be difficult to obtain a certain design or layout for a document
  - it is a bundle of macros for LATEX that aims to carry out everything regarding document formatting, so that the writer only needs to care about the content of the document
  - Building your own macros or using macros developed by others can change the default layout

Preamble

LATEX files begin with the command

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\documentclass[options]{document_type}
```

which states what kind of document will be created.

The default document type is `article` (which is the template we will be using) with a default font size of 10.

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Other choices of document type are

- report (also might be good for a paper)
- book (might be good for a thesis)
- letter

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  - notitlepage
  - titlepage

Packages

Although the class of the document determines its overall general properties, more specific packages can be invoked to change the way commands behave or add extra features.

```
\usepackage[opt1,opt2,...]{package1,package2,...}
```

Note that some of the packages may have options associated with it. What options are available depend on the package itself.

Page Format

A LATEX document uses several commands to set the page format. Each margin is measured from its corresponding edge so using these commands can be tricky

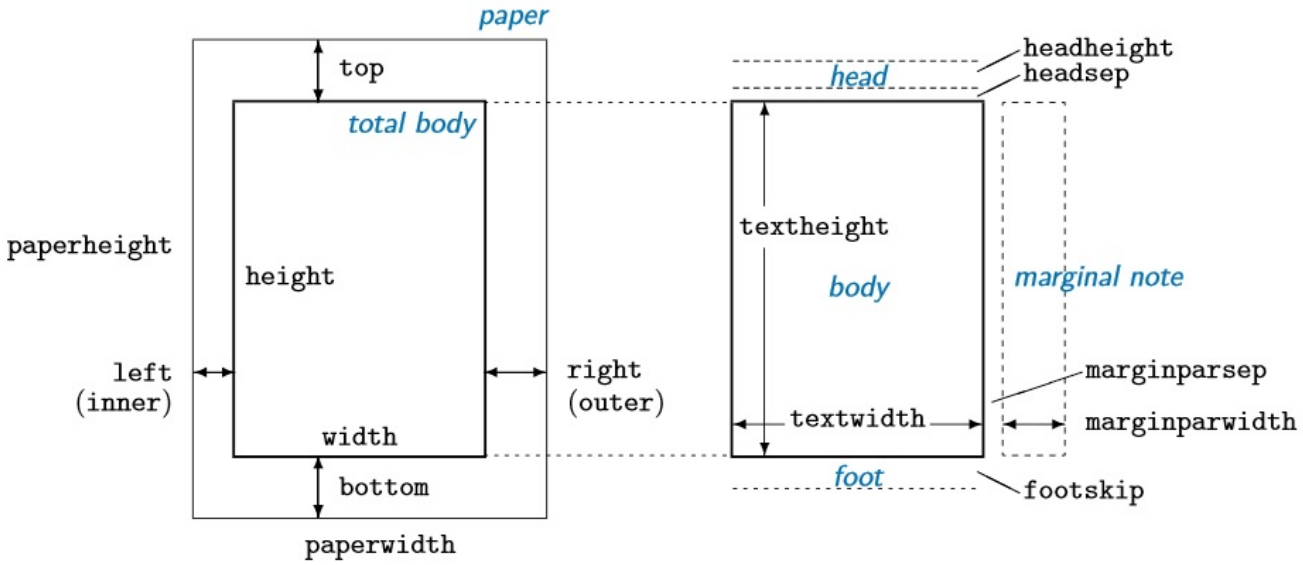

Figure 1: Dimension names used in the geometry package. width = textwidth and height = textheight by default. left, right, top and bottom are margins. If margins on verso pages are swapped by twoside option, margins specified by left and right options are used for the inside and outside margins respectively. inner and outer are aliases of left and right respectively.

ftp://ftp.tex.ac.uk/tex-archive/macros/latex/contrib/geometry/geometry.pdf

There are multiple different ways one can set the margins of the document. The template uses the simpliest line of code to produce 1in margins using the `geometry` package

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```
\usepackage[margin=1in]{geometry}
```

but one can also set each margin to a specific length using

```
\usepackage[top=2in, bottom=1.5in, left=1in,
right=1in]{geometry}
```

Starting the Body of the Paper

Now that you have a basic preamble set up, we can start the body of the paper.

Anything you wanted printed must appear between the lines

```
\begin{document}
     (Text goes here...)
\end{document}
```

No matter what `documentclass` you are using, these two lines of LATEX code always are the same.

Regular Text

Before going into how to format basic parts of your LATEX document, here are some important things to note about LATEX

- Use the command \\ to that indicate a newline should be started.
- LATEX does not automatically indent or seperate paragraphs unless
  - The previous paragraph is terminated with \\
  - and an empty line is left between the previous paragraph and the next in the .txt file
- Hitting ENTER does not indicate a command in LATEX, instead it reads it as a continuation of the previous line unless \\ is included

Title Page

Often a title page is required when writing a paper. To add a title page one needs to use

```
\title{title_text}
\author{Author1\\Institute\\Address \and
          Author2\\Institute\\Address \and ...}
\maketitle      %Displays the Title
\cleardoublepage      %makes body text start on next page
```

Not all these categories need to be included in the `\author` command. You can also have a titlepage without any authors or addresses.

Abstract

If an abstract is needed for a paper, use the command lines

```
\begin{abstract}
      (Text for the abstract)
\end{abstract}
```

This will automatically indent the abstract text and add a centered bolded title "Abstract" above the text.

Sections in the Text

Most papers and other documents, include different sections of the text, such as Background, Methodology, Results, Discussion, and Conclusion. To add these sections to a document, use

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Subsections and other divisions can also be added to a document similarily using any of the following commands followed by the name of the division in curly brackets { }.

- `\subsection`
- `\subsubsection`
- `\paragraph`
- `\subparagraph`
- `\chapter`
- `\part`

Comments

Often you may want to include comments, explanations, reminders, etc. within the document for yourself or for others who may view the code, but don't want it outputted in the document pdf.

To do this just include the character % in the document. This indicates to LATEX that it and the rest of the line should be ignored.

- If multiple lines need to be ignored then each line must be prefixed with %
- The comment character is also helpful in deactivating commands

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If you want large sections of code or text to be ignored you can also place it after the `\end{document}` line in the .txt file and none of it will be outputted or run.

Importing Graphics

Figures, drawings, graphs, etc. can all be imported into a document using the `graphicx` package (no options necessary for this package) by typing

```
\includegraphics[attr1=val1, ...]{imagename}
```

- Accepts the use of .jpg, .png, and .pdf saved files to be inserted into the document.
- The graphic being imported must be saved in the same folder that the .txt file of the document you are creating is found, otherwise the path to the document must be included.
- The graphic file extension (.jpg, .png, .pdf) should be included in the `imagename`
- Don't use spaces in the image file name. If can't avoid spaces, use the underscore instead

There is a variety of attributes that can be set. Only the most common are covered below

code	description
`key=value`	Reference Key for the image
`width=xx`	Specify the preferred width of the image to `xx`
`height=xx`	Specify the perferred height of the image to `xx`
`scale=xx`	Scales the image by the desired scale factor. (e.g. 0.5 scales by half, while 2 doubles size)
`angle=xx`	Rotates the image by `xx` degrees
`trim= l b r t`	Crops image by `l` from the left, `r` from the right, `t` from the top, and `b` from bottom
`page=x`	If image is a pdf file of multiple pages, this allows you to use a different page than the first
`resolution=x`	Specify image resolution in dpi

Often though you want to include a caption or a cross-reference with a given graphic. To do this you will need to use a `figure` environment

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

placement	Permission
h	Position here (approximately where it occurs in the text)
t	Position at the top of the page
b	Position at the bottom of the page

Inside the `figure` environment, e.g. `... figure contents...` , you should include

- the graphic by `\includegraphics[attr1=val1, ...]{imagename}`
- captions before or after a graphic by using `\caption{text}` before or after `\includegraphics{...}`, respecitively;
- labels using `\label{marker}`, where the conventional `marker` is `fig:my_figure`.
  - Use ∼ `\ref{fig:my_figure}` to refer to a specific figure in the text of the document.
- one can center the graph and caption by also including `\centering`

Basic Equation Format

As stated earlier, LATEX makes inputting equations into a document very simple. There are several different mathematical environments, but these are the most common

- `$formula$`
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- `$formula$`
  - inputs the `formula` within the text
- `$$formula$$` or `\[ formula \]`
  - centers the given `formula` on the following line
- `\begin{eqnarray} formulas \end{eqnarray}`
  - allows multiple lines to be inputted into the environment
  - use & before and after any symbol in all the formulas to align all of them vertically by those symbols
  - mark the end of an equation line by \\
  - use the *-form to stop LATEX from automatically labeling each formula with a reference number

Listed below are the main elements of mathematical formula symbols given in LATEX. A more extensive list can be found in the additional reference LatexMathSymbols.pdf.

LATEX code	description
, -, /, *+	addition, subtraction, division, multiplication
[,], (,),\{, \}	parentheses
{, }	logically combine parts
^ (carrot)	raise to a power, use { } if more than 1 digit
_ (dash)	subscript, use { } if more than 1 digit subscript
\sum	summation symbol, $\sum$
\int	integration symbol, $\int$
\frac{num}{denom}	makes a fraction, $\frac{1}{2}$

Footnotes

Including footnotes into a paper is very simple, just use the command

```
\footnote{footnote_text}
```

Do not leave a space between the command and the word where you wish the footnote marker to appear otherwise the footnote will not look as intended

- LATEX will typeset the footnote at the bottom of the page for you
- LATEX automatically numbers each footnote sequentially, unless otherwise commanded
- It is also possible to add footnotes manually, customize the footnote appearance, and even reset the automatic footnote counter (these topics are not covered here)

References/Bibliography

One way to add a bibliography to a document is using the built-in LATEX environment `thebibliography`.

```
\begin{thebibliography}{sample_label}
    reference_entries
\end{thebibliography}
```

- put the code used for `thebiblography` environment wherever you desire the bibliography to show in your document (usually at the end before the `\end{document}`)
- `sample_label`
  - is a number which indicates the number of references
  - if a single digit number then indicating there is no more than nine reference entries in total
  - if a two-digit number then indicating that there is between 10 and 99 reference entries.

The individual `reference_entries` in the bibliography each begin with

`\bibitem[label]{key} entry_text`

- `label` is an optional argument that is an indicator, such as an abbreviation of the author's name or arbitrary reference number. Without it, `\bibitem` produces a running number in square brackets as a label for the reference.
- `key` is a reference keyword that does not appear in the bibliography but is used to make a citation in the text by inputting the citation's `label`.
  - input `\cite{key}` in the text to produce the citation reference.

One can also use `Bibtex` to add a Bibliography to a document.

Kopka, Helmut, and Patrick W. Daly. A Guide to LATEX: Document Preparation for Beginners and Advanced Users. Harlow, England: Addison-Wesley, 1999. Print.

"LaTeX." - Wikibooks, Open Books for an Open World. Wikibooks, 25 Oct. 2013. Web. 16 Jan. 2014. <http://en.wikibooks.org/wiki/LaTeX>.