Latex

LATEX is a tool used to create professional-looking documents.

Overleaf: https://www.overleaf.com/project

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Overview

Basics of Latex

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4. Bold, italics and underlining
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Basics:

CREATION STEPS:

The first step is to create a new LATEX project. You can do this on your own computer by creating a new **.tex** file, or else you can start a new project in Overleaf.

Overleaf: https://www.overleaf.com/project

Simplest working example:

```
\documentclass{article}


\begin{document}
First document. This is a simple example, with no
extra parameters or packages included.
\end{document}
```

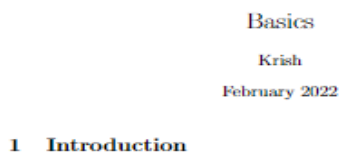
First document. This is a simple example, with no extra parameters or packages included.

DEFAULT START CODE FOR DOCUMENT:

File: main.tex

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Basics}
\author{Krish }
\date{February 2022}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Output:



1. THE PREAMBLE OF A DOCUMENT

- In the previous example the text was entered after the **\begin{document}** command.
- Everything in your .tex file before this point is called the preamble.
- In the preamble you define the type of document you are writing, the language you are writing in, the packages you would like to use (more on this later) and several other elements.

Preamble would look like this:

```
\documentclass[12pt, letterpaper]{article}
\usepackage[utf8]{inputenc}
```

Line 1:

The first line of code declares the type of document, known as the **class**.

- As said before, this defines the type of document. Some additional parameters included in the square brackets can be passed to the command.
- These parameters must be comma-separated. In the example, the extra parameters set the **font size (12pt)** and the **paper size (letterpaper).**
- Of course, other font sizes **(9pt, 11pt, 12pt)** can be used, but if none is specified, the default size is 10pt. As for the paper size other possible values are a4paper and legal paper;
- TThe content of our document, enclosed inside the **\begin{document}** and **\end{document}**

Class type: article, Book, Report

Syntax: \documentclass[option1, option2, etc.]{article}

- **Font size (10pt, 11pt, 12pt)**

The following example sets the global document font size to 12pt.

```
\documentclass[12pt]{article}
\usepackage{blindtext}

\begin{document}
\blindtext
\end{document}
```

- **Paper size and format (a4paper, letterpaper, etc.)**

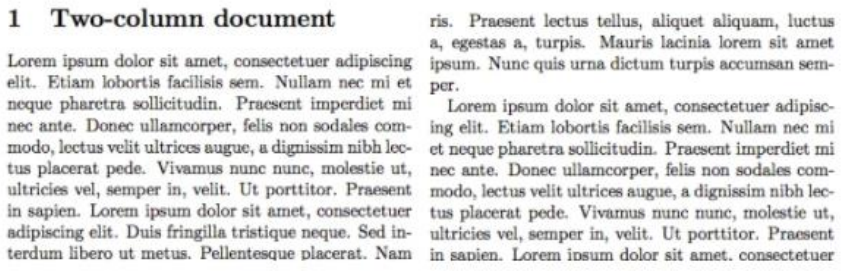
  Available Paper size and format

  - a4paper (default)
  - letterpaper (default in some distributions)
  - a5paper
  - b5paper
  - executivepaper
  - legalpaper

```
\documentclass[a4paper]{article}
\usepackage{showframe}

\begin{document}
\begin{center}{\Huge A4 paper}\end{center}
\end{document}
```

- **Multiple columns (onecolumn, twocolumn)**

  - onecolumn (default)
  - twocolumn



1 Two-column document

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam ris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer

By default, text is typeset in a single column (onecolumn). LaTeX provides an easy way to switch to two columns through the document-class option twocolumn.

CODE:

```
\documentclass[10pt,a4paper,twoside,twocolumn, english]{report}
\usepackage[utf8]{inputenc}

\title{First document Title}
\author{Krish\thanks{funded by the XXX team}}
\date{February 2022}

\begin{document}

\maketitle

An asteroid is a minor planet of the inner Solar System. Historically, these terms have been applied to any astronomical object orbiting the Sun that did not resolve into a disc in a telescope and was not observed to have characteristics of an active comet such as a tail. As minor planets in the outer Solar System were discovered that were found to have volatile-rich surfaces similar to comets, these came to be distinguished from the objects found in the main asteroid belt.[1] Thus the term "asteroid" now generally refers to the minor planets of the inner Solar System, including those co-orbital with Jupiter. Larger asteroids are often called planetoids.

% This line here is a comment. It will not be printed in the document.

\end{document}
```

OUTPUT: TWOCOLUMN OUTPUT FILE IN ZIP FILE

Line 2:

\usepackage[utf8]{inputenc}

This is the encoding for the document. It can be omitted or changed to another encoding but utf-8 is recommended. Unless you specifically need another encoding, or if you are unsure about it, add this line to the preamble.

2. ADDING A TITLE, AUTHOR AND DATE

- To add a title, author and date to our document, you must add three lines to the preamble (NOT the main body of the document). These lines are

- **\title{First document}** - This is the title.

    - Titlepage behavior (notitlepage, titlepage)

        - **notitlepage** (default for article)
        - **titlepage** (default for report and book)

        - The option titlepage ends the page after **maketitle** and restarts on the next page. In article, the content starts right after **maketitle**.

        - The titlepage option is quivalent to:

```
\maketitle
\clearpage
```

        - The example below illustrates the default behavior of article.

```
\documentclass{article}
\usepackage{blindtext}

\title{This is an article}

\begin{document}

\maketitle

\begin{abstract}
\blindtext
\end{abstract}
\end{document}
```

- **\author{Krish}**

  Here you put the name of the Author(s) and, as an optional addition, you can add the next command within the curly braces:

- **\thanks{funded by the XXXX team}**

  This can be added after the name of the author, inside the braces of the author command. It will add a superscript and a footnote with the text inside the braces. Useful if you need to thank an institution in your article.

- **\date{February 2022}**

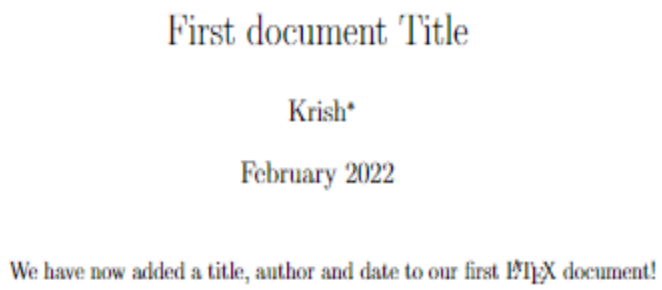
  You can enter the date manually or use the command \today so the date will be updated automatically at the time you compile your document

- Now that you have given your document a title, author and date, you can print this information on the document with the \maketitle command. This should be included in the body of the document at the place you want the title to be printed.

CODE:

```
\documentclass[12pt, letterpaper, twoside]{article}
\usepackage[utf8]{inputenc}

\title{First document Title}
\author{Krish\thanks{funded by the XXX team}}
\date{February 2022}

\begin{document}

\maketitle

We have now added a title, author and date to our first \LaTeX{} document!

\end{document}
```

OUTPUT:



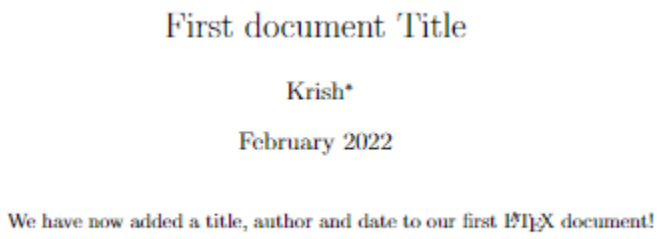
3. ADDING COMMENTS

- Comments are pieces of text you can include in the document which will not be printed, and will not affect the document in any way

CODE

```
\begin{document}


\maketitle


We have now added a title, author and date to our
first \LaTeX{} document!


% This line here is a comment. It will not be printed
in the document.


\end{document}
```

OUTPUT :



4. BOLD, ITALICS AND UNDERLINING

- **Bold:** Bold text in LaTeX is written with the \textbf{...} command.
- **Italics**: Italicised text in LaTeX is written with the \textit{...} command.
- **Underline**: Underlined text in LaTeX is written with the \underline{...} command.

CODE:

```
\documentclass[a4paper,10pt,leqno]{article}

\begin{document}

 Some of the \textbf{greatest}

discoveries in \underline{science}

were made by \textbf{\textit{accident}}.

\end{document}
```

OUTPUT:

Some of the **greatest** discoveries in science were made by ***accident***.

- Another very useful command is the **\emph{...}** command. What the **\emph** command actually does with its argument depends on the context - inside normal text the emphasized text is italicized, but this behaviour is reversed if used inside an italicized text- see example below:

CODE:

```
\Documentclass[a4paper,10pt,leqno]{article}
\begin{document}
 some of the greatest \emph{discoveries}
in science
were made by accident.

\textit{some of the greatest \emph{discoveries}
in science
were made by accident.}

\textbf{some of the greatest \emph{discoveries}
in science
were made by accident.}
\end{document}
```

OUTPUT:

Some of the greatest *discoveries* in science were made by accident.
Some of the greatest discoveries *in science were made by accident.*
Some of the greatest *discoveries* in science were made by accident.

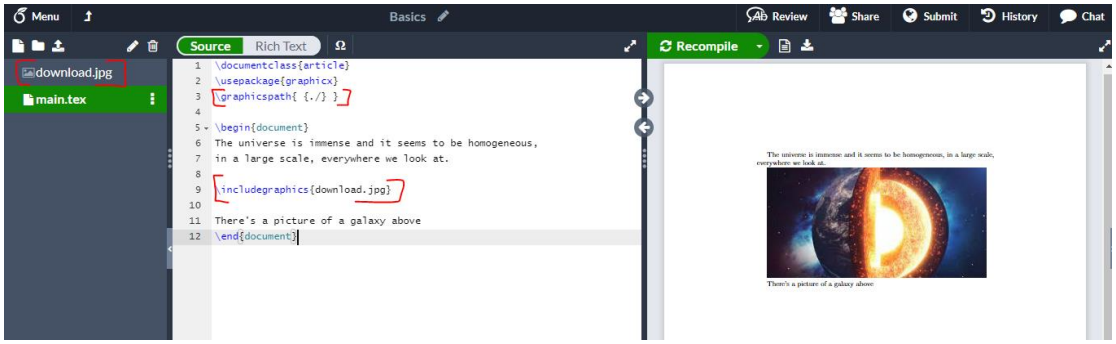
5. ADDING IMAGES

- Latex cannot manage images by itself, so we need to use the graphicx package.
- To use it, we include the following line in the preamble: **\usepackage{graphicx}.**
- The command **\graphicspath{ {./} }** tells LATEX that the images are kept in a folder named images under the directory of the main document.
- The **\includegraphics{ download }** command is the one that actually included the image in the document.

CODE:

```
\documentclass{article}
\usepackage{graphicx}
\graphicspath{ {./} }

\begin{document}
The universe is immense and it seems to be homogeneous,
in a large scale, everywhere we look at.

\includegraphics{download.jpg}

There's a picture of a galaxy above
\end{document}
```

OUTPUT:



The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.

There's a picture of a galaxy above

6. CAPTIONS, LABELS AND REFERENCES OF IMAGES

- Images can be captioned, labelled and referenced by means of the figure environment as shown below:

CODE:

```
\documentclass{article}
\usepackage{graphicx}
\graphicspath{ {images/} }

\begin{document}

\begin{figure}[h]
   \centering
   \includegraphics[width=0.25\textwidth]{mesh}
   \caption{a nice plot}
   \label{fig:mesh1}
\end{figure}

As you can see in the figure \ref{fig:mesh1}, the
function grows near 0. Also, in the page \pageref{fig:mesh1}
is the same example.

\end{document}
```

OUTPUT:

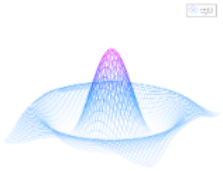


Figure 1: a nice plot

As you can see in the figure 1, the function grows near 0. Also, in the page 1 is the same example.

There are three important commands in the example:

- **\caption{a nice plot}:** As you may expect this command sets the caption for the figure. If you create a list of figures this caption will be used there. You can place it above or below the figure.
- **\label{fig:mesh1}:** If you need to refer the image within your document, set a label with this command. The label will number the image, and combined with the next command will allow you to reference it.
- **\ref{fig:mesh1}:** This code will be substituted by the number corresponding to the referenced figure.

7. CREATING LISTS IN LATEX

- List starts with **\begin{...}** command and end with an **\end{...}** command.
- There are two main different types of lists, **ordered lists and unordered lists**. Each will use a different environment.
- List can be created in **different environment.** Environments are sections of our document that you want to present in a different way to the rest of the document.

7.1 UNORDERED LISTS

- Unordered lists are produced by the itemize environment. Each entry must be preceded by the control sequence **\item** as shown below.

CODES :

```
\begin{itemize}
  \item The individual entries are indicated with a black dot, a so-called bullet.
  \item The text in the entries may be of any length.
\end{itemize}
```

OUTPUTS:

- The individual entries are indicated with a black dot, a so-called bullet.
- The text in the entries may be of any length.

7.2 ORDERED LISTS

- Ordered list have the same syntax inside a different environment. We make ordered lists using the **enumerate** environment

CODES :

```
\BEGIN{ENUMERATE}
 \ITEM THIS IS THE FIRST ENTRY IN OUR LIST
 \ITEM THE LIST NUMBERS INCREASE WITH EACH ENTRY WE ADD
\END{ENUMERATE}
```

OUTPUT:

1. This is the first entry in our list
2. The list numbers increase with each entry we add

8. ADDING MATH TO LaTeX

- LATEX allows two writing modes for mathematical expressions: the inline mode and the display mode.
- The inline mode is used to write formulas that are part of a text.
- The display mode is used to write expressions that are not part of a text or paragraph, and are therefore put on separate lines.
- To put your equations in **inline mode** use one of these delimiters:

\(... \), $ ... $ or \begin{math} ... \end{math}.

Code:

```
In physics, the mass-energy equivalence is stated
by the equation $E=mc^2$, discovered in 1905 by Albert Einstein.
```

Output

In physics, the mass-energy equivalence is stated by the equation $E = mc^2$, discovered in 1905 by Albert Einstein.

- The **displayed mode** has two versions: numbered and unnumbered.
- To print your equations in display mode use one of these delimiters:

\[... \], \begin{displaymath} ... \end{displaymath} or

\begin{equation} ... \end{equation}

Code:

```
The mass-energy equivalence is described by the famous equation
\[ E=mc^2 \]
discovered in 1905 by Albert Einstein.

In natural units ($c = 1$), the formula expresses the identity

\begin{equation}
E=m
\end{equation}
```

Output

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

discovered in 1905 by Albert Einstein. In natural units ($c = 1$), the formula expresses the identity

$$E = m \tag{1}$$

9. BASIC FORMATTING

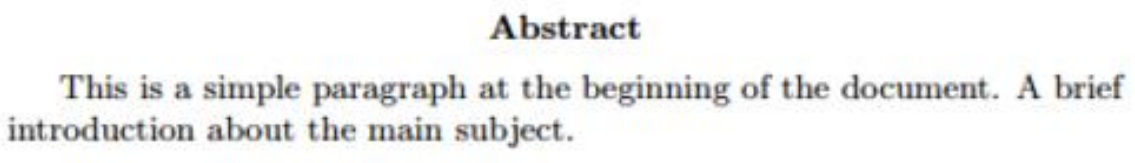
9.1 Abstract

- In LATEX there's the abstract environment
- The **abstract** environment will put the text in a special format at the top of your document.

CODE:

```
\begin{document}


\begin{abstract}
This is a simple paragraph at the beginning of the
document. A brief introduction about the main subject.
\end{abstract}
\end{document}
```

OUTPUT:



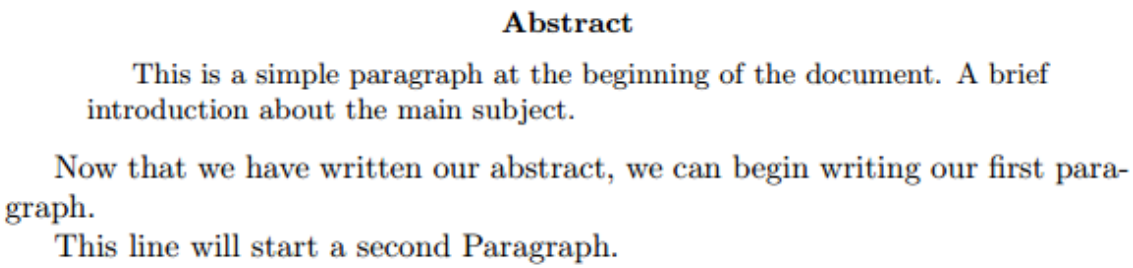
9.2 Paragraphs and newlines

- To start a new line without actually starting a new paragraph insert a break line point, this can be done by \\ **(a double backslash as in the example) or the \newline command.**
- Care should be taken that multiple \\ or \newlines are not used to "simulate" paragraphs with larger spacing between them, as this can interfere with LATEX's typesetting algorithms. The recommended method to do so is to keep using double blank lines to create new paragraphs without any **\\,** and then add **\usepackage{parskip}** to the preamble.

- **CODE:**

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\begin{document}


\begin{abstract}
This is a simple paragraph at the beginning of the
document. A brief introduction about the main subject.
\end{abstract}

Now that we have written our abstract, we can begin writing our first
paragraph.

This line will start a second Paragraph.
\end{document}
```

- **OUTPUT:**



Abstract

This is a simple paragraph at the beginning of the document. A brief introduction about the main subject.

Now that we have written our abstract, we can begin writing our first paragraph.

This line will start a second Paragraph.

9.3 Chapters and Sections

- Commands to organize a document vary depending on the document type, the simplest form of organization is the sectioning, available in all formats.
- The command **\section{}** marks the beginning of a new section, inside the braces is set the title.
- Section numbering is automatic and can be disabled by including a ***** in the section command as **\section*{}.**
- **\subsection{}s, and \subsubsection{}s** are also included

- The basic levels of depth are listed below:

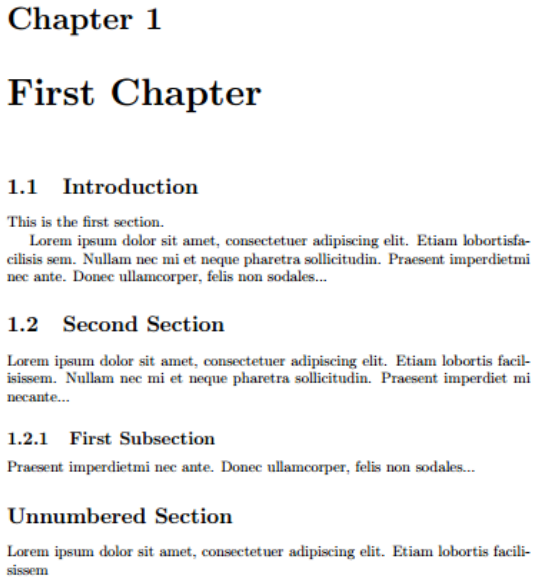
-1	`\part{part}`
0	`\chapter{chapter}`
1	`\section{section}`
2	`\subsection{subsection}`
3	`\subsubsection{subsubsection}`
4	`\paragraph{paragraph}`
5	`\subparagraph{subparagraph}`

Note that `\part` and `\chapter` are only available in *report* and *book* document classes.

➢ CODE:

```
\chapter{First Chapter}

\section{Introduction}

This is the first section.

Lorem ipsum dolor sit amet, consectetuer adipiscing
elit. Etiam lobortisfacilisis sem. Nullam nec mi et
neque pharetra sollicitudin. Praesent imperdietmi nec ante.
Donec ullamcorper, felis non sodales...

\section{Second Section}

Lorem ipsum dolor sit amet, consectetuer adipiscing elit.
Etiam lobortis facilisissem. Nullam nec mi et neque pharetra
sollicitudin. Praesent imperdiet mi necante...

\subsection{First Subsection}
Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...

\section*{Unnumbered Section}
Lorem ipsum dolor sit amet, consectetuer adipiscing elit.
Etiam lobortis facilisissem
```

➢ OUTPUT



Chapter 1

First Chapter

1.1 Introduction

This is the first section.
Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortisfacilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...

1.2 Second Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisissem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi necante...

1.2.1 First Subsection

Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...

Unnumbered Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisissem

10. CREATING TABLES

10.1 Creating a simple table in LaTeX

- The tabular environment is the default LATEX method to create tables.
- You must specify a parameter to this environment, in this case **{c c c}.**
- This tells LATEX that there will be **three columns** and that the text inside each one of them must be **centred**.
- We can also use **r** to align the text to the right and **l** for left alignment.
- The alignment symbol **&** is used to specify the breaks in the table entries.
- To go to the next line of your table, we use the new line **command \\.** We wrap the entire table inside the center environment so that it will appear in the center of the page.

CODE:

```
\begin{center}
\begin{tabular}{ c c c }
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9
\end{tabular}
\end{center}
```

- **OUTPUT:**

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

10.2 Adding borders

You can add borders using the horizontal line command \hline and the vertical line parameter |.

- **{ |c|c|c| }:** This declares that three columns, separated by a vertical line, are going to be used in the table. The | symbol specifies that these columns should be separated by a vertical line.
- **\hline:** This will insert a horizontal line. We have included horizontal lines at the top and bottom of the table here. There is no restriction on the number of times you can use **\hline**.

- **CODE:**

```
\begin{center}
\begin{tabular}{ |c|c|c| }
 \hline
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9 \\
 \hline
\end{tabular}
\end{center}
```

- **OUTPUT:**

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

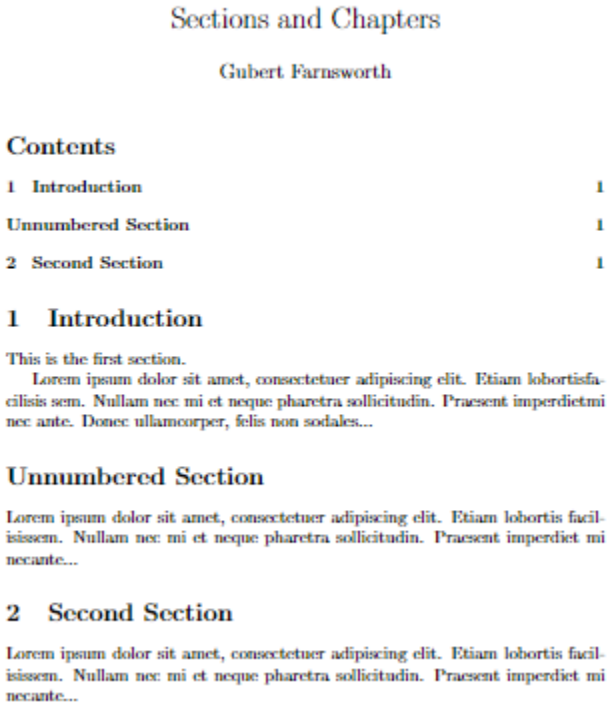
11. Adding a Table of Contents

- To create the table of contents is straightforward, the command **\tableofcontents** does all the work for you:
- Sections, subsections and chapters are automatically included in the table of contents.
- To manually add entries, for example when you want an unnumbered section, use the command **\addcontentsline** as shown in the example.
- **CODE:**

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Sections and Chapters}
\author{Gubert Farnsworth}
\date{ }

\begin{document}

\maketitle

\tableofcontents

\section{Introduction}

This is the first section.

Lorem ipsum dolor sit amet, consectetuer adipiscing
elit.  Etiam  lobortisfacilisis sem.  Nullam nec mi et
neque pharetra sollicitudin.  Praesent imperdietmi nec ante.
Donec ullamcorper, felis non sodales...

\section*{Unnumbered Section}
\addcontentsline{toc}{section}{Unnumbered Section}

Lorem ipsum dolor sit amet, consectetuer adipiscing elit.
Etiam lobortis facilisissem.  Nullam nec mi et neque pharetra
sollicitudin.  Praesent imperdiet mi necante...

\section{Second Section}

Lorem ipsum dolor sit amet, consectetuer adipiscing elit.
```

```
Etiam lobortis facilisissem.  Nullam nec mi et neque pharetra
sollicitudin.  Praesent imperdiet mi necante...

\end{document}
```

OUTPUT:



Sections and Chapters

Gubert Farnsworth

Contents

1 Introduction

This is the first section.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortisfacilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...

Unnumbered Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisissem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi necante...

2 Second Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisissem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi necante...

12. **FORMULA-SPECIFIC OPTIONS** (fleqn and leqno)

- These are two **independent** options manipulating the alignment and label position of formulas.

  - **fleqn**: left-alignment of formulas

CODE :

```
\documentclass[a4paper,10pt,fleqn]{article}

\begin{document}

  \begin{eqnarray}
  7x + 4y &=  & 0 \\
  2x - 5y &=  & 0
   \end{eqnarray}

\end{document}
```

OUTPUT:

$$7x + 4y = 0 \quad (1)$$
$$2x - 5y = 0 \quad (2)$$

  - **leqno**: labels formulas on the left-hand side instead of right

CODE :

```
\documentclass[a4paper,10pt, leqno]{article}

\begin{document}

  \begin{eqnarray}
  7x + 4y &=  & 0 \\
  2x - 5y &=  & 0
   \end{eqnarray}

\end{document}
```

OUTPUT:

$$
\begin{aligned}
&(1) && 7x + 4y &&= 0 \\
&(2) && 2x - 5y &&= 0
\end{aligned}
$$

13 Layout Formatting

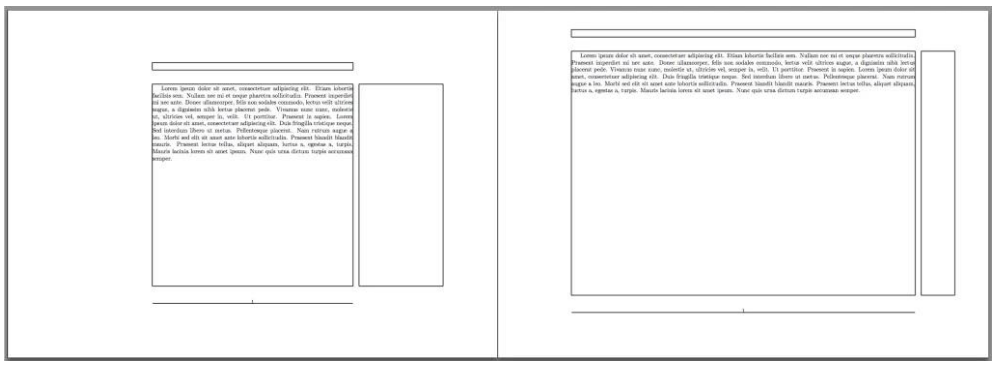
- **Landscape print mode (landscape)**

The **landscape** option changes the page layout to landscape mode.

CODE :

```
\documentclass[a4paper]{article}

\usepackage{blindtext, showframe}

\usepackage[landscape]{geometry}


\begin{document}

\blindtext

\end{document}
```

OUTPUT



- **Single- And Double-Sided Documents (Oneside, Twoside)**

  - oneside (default for article and report)
  - twoside (default for book)

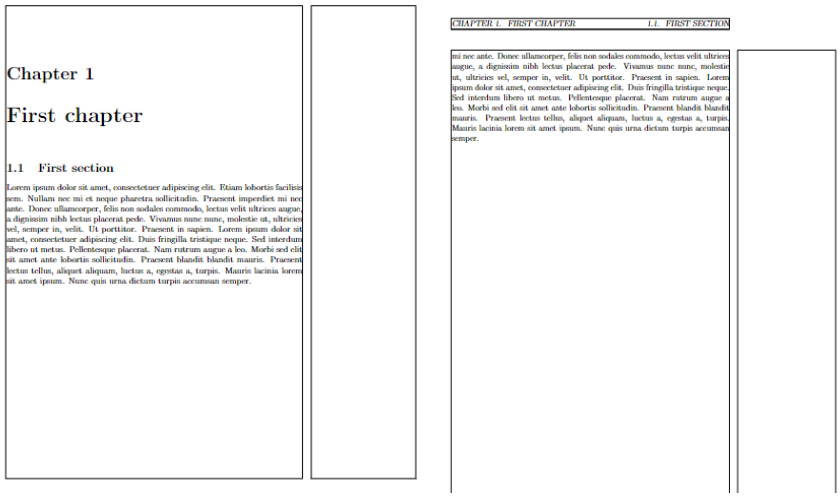
  - In single-sided documents (oneside), the left and right margins are symmetric and headers are exactly the same on every page. In other words, the document does not distinguish between inner and outer margin.
  - Twoside, on the other hand, generates double-sided content. The outer margin (even page: left; odd page: right) is wider by default (see figure below). It might appear that the header "switches" sides, but that because they are placed with respect to the margins.

CODE :

```
\documentclass[twoside]{report}
\usepackage{blindtext, showframe, fancyhdr}
\pagestyle{fancy}

\begin{document}
\chapter{First chapter}
\section{First section}
\blindtext
\clearpage
\Blindtext
\end{document}
```

  - The twoside option is usually set for bound texts such as theses or books.

OUTPUT



- **Chapter opening page (openright, openany)**

  - openany (default for report)
  - openright (default for book)

  - Finally, the option openright always starts a chapter on the right (odd pages), leaving one page blank in case the last paragraph of the previous chapter ended on an odd page. It only works and makes sense with the twoside option set. The openany option starts the chapter on the next page (even or odd).
  - The openany, openright options are not available in article as it does not support \chapter!

CODE :

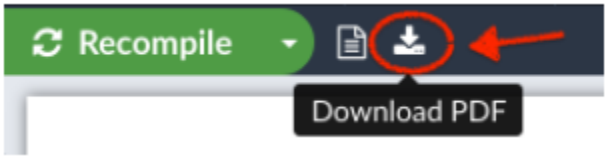
```
\documentclass[twoside, openright]{report}

\usepackage{blindtext}

\begin{document}

\chapter{First chapter}

\blindtext

\chapter{Second chapter}

\blindtext

\end{document}
```

OUTPUT

Chapter opening page Output.Pdf

Downloading your finished document

You can download your finished PDF from the left hand menu as above by clicking *PDF*.



References:

- **https://www.overleaf.com/**