

Introduction to L^AT_EX

Alisa Ediger

University of Oklahoma CODE Workshop 2023

1 Introduction

LaTeX (pronounced Lah-tek or Lay-tek) is a software system for document preparation, similar to Word or Docs, but allows for more technical scientific writing, math symbols, and more customizable formatting.

It is largely used in academic writing, especially in STEM related fields, however can be used for any document preparation including essays, resumes, and CVs.

For the presentation that goes along with this document, visit the following link or QR Code:

<https://docs.google.com/presentation/d/1DfcSLI5uoJNoe7hHTVG5vVQbV9ymHkFafyJepsR96LA/>



If you are looking at the PDF of this document and want to access the TeX file on Overleaf, follow:

<https://www.overleaf.com/read/msfvdvhppcbg>



2 Special Characters

There are several special characters to be aware of:

- `$` Enter math mode: Use one at the beginning and end math to keep it in-line. Use two for display mode: centered on a new line.
- `\` Use one for the start of a command. Use two together for a line break.
- `&` The alignment symbol used in `align`, `array`, and `tabular` environments (4.3).
- `{}` Used to define the input of a command
- `%` Used to comment out a line so it won't show up in the formatted document, but will remain in the TeX files.
- `#` Used to reference arguments in commands (4.2).
- `^` Used for superscripts in math mode
- `_` Used for subscripts in math mode

To type special characters as text use a backslash in front of them - except for the backslash, `\`, which needs `\textbackslash` and the caret `^` which needs `\wedge`.

3 Math Symbols

There are tons of math symbols you can type. Rather than going through them all here, I will point you to Detexify where you can draw a symbol and it will show you how to TeX it. Just be sure to add any packages needed and double check if its meant to be used in math mode or text.

4 Shortcuts, Commands, and Environments

4.1 Shortcuts

If you find yourself typing the same TeX over and over, its a good idea to make a shortcut for it. A rule of thumb is if you are going to use it more than 3 times, make a shortcut. Not only will shortcuts save you time, if you decide to change your notation, you can update the shortcut and it will update everywhere in your document, whereas if you type it out each time, you'll have to go through and change it everywhere.

Example 4.1. Say I am talking about a series:

$$\sum_{i=1}^{\infty} a_i$$

This TeX is `\sum_{i=1}^{\infty} a.i`. That's a lot to type over and over again. Instead I can define a shortcut by adding to my preamble using the form

`\def \Shortcut {output}`

The shortcut needs a unique name, so perhaps I call mine *sii* for "sum from i to infinity". It can be whatever you want, as long as it doesn't already have a meaning in TeX. In my preamble I put

`\def\sii{\sum_{i=1}^{\infty} a_i}`

Now, when I want to reference this, all I need to type is `\sii`

$$\sum_{i=1}^{\infty} a_i$$

4.2 Commands

Commands start with a backslash, then the command name, then an input (if applicable). For example if I want to make text bold, I need to use the `\textbf` command. So `\textbf{the text I want to be bold}` gives us **the text I want to be bold**.

You can make your own commands using this form:
`\newcommand{CommandName}[number of inputs]{the command}`

Example 4.2. I want to use parenthesis around my series, but just typing them looks funny because they are too small for the sum:

$$(\text{\sii}) \implies \left(\sum_{i=1}^{\infty} a_i\right)$$

I can make them bigger by adding `\left` and `\right` as follows

`\left(\text{\sii} \right)`

$$\implies \left(\sum_{i=1}^{\infty} a_i\right)$$

but I don't want to type that out all the time, especially if I am nesting a lot of parenthesis, so I define a new command `\p` to make auto-sizing parenthesis.

In my preamble I add `\newcommand{\par}[1]{\left(#1 \right)}`.

$$\text{\p{\sii}} \implies \left(\sum_{i=1}^{\infty} a_i\right)$$

4.3 Environments

Environments format a large section of data. All environments are called as follows:

`\begin{environment}`

Whatever you are putting into your environment

`\end{environment}`

There are two types of environments math and text. Text environments use plane text as it's input. If you want to add math into your environment, you will need to use \$\$ just like in the regular body of your document

Here are a few common text environments:

- *itemize* - makes a bulleted list, like this one
- *enumerate* - makes a numbered list
- *center* - centers text on the page
- *tabular* - make a table

Example 4.3. Here is an example of a table:

Letters	Numbers	Greek
a	1	α
b	2	β

Here's what the TeX looks like for it:

```
\begin{center} \\
\begin{ tabular}{l|c|r}\\
Letters & Numbers & Greek\\
\hline
a & 1 & $\alpha$ \\
b & 2 & $\beta$ \\
\end{tabular} \\
\end{center}
```

Math environments put everything inside the environment in math mode. That means, if you want to type plain text, you need to put it in the `\text{}` command. The most common one is *align* which we use for multiple lines of math. Separate new lines with `\\` and in each line use `&` to tell the environment how to stack the lines. The `&`'s will all fall at the same distance on the page.

Example 4.4. Say I want to stack up a bunch of equivalences at the equals signs as follows

$$\begin{aligned}
 \sum_{i=1}^{\infty} a_i &= a_1 + a_2 + a_3 + \cdots \\
 &= 1 + 2 + 3 + \cdots \\
 &= \infty
 \end{aligned}$$

I would type

```
\begin {align*}
\sii &= a_1+a_2+a_3+\cdots \\
&= 1+2+3+\cdots \\
&= \infty \\
\end {align*}
```

5 Resources

The sky is the limit! Find out how to do exactly what you want with these helpful resources:

1. Detexify: draw a symbol to get the TeX code and necessary packages
2. Quiver: use the intuitive tool to draw diagrams, then copy and paste the TeX code. Note that this requires the *tikzpicture* package in your preamble.
3. Stack Exchange: Chances are, whatever you are trying to do, someone else also wanted to know about it. Search for your question to get solutions and tips from other LaTeX users. If it turns out no one has asked the question before, you can ask it yourself and get help from the community

6 Practice

Try the following on your own:

1. Find and open a template on Overleaf. Edit the name, date, and title (if applicable). Find one thing in the TeX file you don't know what it is or how it works. Search on StackExchange to try and figure out. TIP: you can go between specific spots in the TeX and the PDF using the arrows on the bar in between them.
2. Can you write the Pythagorean Theorem? What about the Quadratic Formula? Your outputs should look like this:

$$a^2 + b^2 = c^2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Hint: Try to see if you can figure out the commands for a fraction and square root without looking them up by using Overleaf's autofill feature. Try using DeteXify for the plus/minus symbol.

3. Define a shortcut and a new command.
4. Scroll through this TeX file and find something (command, environment, package, etc) I used in this document that we did not discuss in the presentation. Try explaining it to someone next to you and see if you can walk them through how to type it without them looking.
5. Start your own project that you could use in your field. It could be anything: typing up class notes, making a table, writing a paper, an equation, a resume - whatever you would use LaTeX for. If you get stuck, try using the resources in Section 5 or asking for help.