Introduction to LaTeX

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1 Introduction

In this workshop, we'll be looking at how to create a basic document in LaTeXthat includes some math. There are a few important things to mention before we get underway:

LaTeXis not WYSIWYG, or What You See Is What You Get, like Microsoft Word. You must write and compile code to create a document, usually multiple times as you are writing to see how it looks. This can be challenging at first, but it makes formatting and changing the appearance of your document a breeze. It's especially helpful for adding math symbols and equations to your documents.

The fastest and easiest way to start using LaTeXis to use an online editor. In this workshop, we'll be using ShareLaTeX. Please navigate to

https://www.sharelatex.com/

and either log in or register. Either one should take less than a minute.

If you should wish to install LaTeXdirectly on your computer, instructions—along with excellent LaTeXhelp in general—can be found at

https://www.reed.edu/cis/help/latex/

Google is your friend when it comes to LaTeX. I still look up commands constantly when writing a document and encourage you to do the same. Don't wait until you know everything to try writing a document. It's better to get started and look things up as you go along!

2 Document Structure

2.1 A Basic Document

Now that you're logged in to ShareLaTeX, open a "Blank Project" and give it a name. ShareLaTeX should automatically populate your text editor with something like this:

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

\title{My first project}
\author{scharberh }
\date{August 2017}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Update your title and author name, if you like. Try changing the date to `\today`. Everything above `\begin{document}` is called the Preamble—it provides information to LATEX, but only commands you give after `\begin{document}` will actually appear in your document.

Now type something into your document under the section heading. Click the button that says **Recompile**. Tada! You have made your first document.

2.2 Changing the Document Heading

If this style of document does not suit your needs, don't worry - LATEXis very flexible. For instance, you may want to begin the solutions to your problem sets with no title, and instead use a line like this one:

MATH 111 Problem Set 1   Helen Scharber, August 25, 2017

You can do this by simply omitting the commands to create the title and the section heading and adding code to create a specially-formatted line in your document:

```
\begin{document}

\noindent {
{\bf{MATH 111 Problem Set 1}} \hfill Helen Scharber, \today
}
\bigskip

Hello world!
\end{document}
```

Try copying these commands into your document and click Recompile again to see how your document looks now.

2.3   Sections and Subsections

A nice feature of LATEXis its ability to automatically number sections and subsections. Try adding some section and subsection headings back in to your document and see how it looks:

```
\begin{document}

\noindent {
{\bf{MATH 111 Problem Set 1}} \hfill Helen Scharber, \today
}
\bigskip

\section{A section}
\subsection{A subsection}
Hello world!

\section{Another section}

\section*{No-Number Section}
```

```
\end{document}
```

The asterisk tells us not to number a section. The same rule applies for equations and other numbered environments.

3   Including Math

There are several ways to include math in LaTeX.

3.1   Inline Math

One method of including math is "in-line," by using $ symbols around your math. For example, to create the line:

Consider the equation $x^2 + y = 1$

I would type the following:

```
Consider the equation $x^{2}+y=1$.
```

This allows me to include small math objects in a paragraph of text. Try adding an inline expression or equation to your document.

3.2   Equation Environment

You may also use the equation environment. To create the following:

$$x + 1 = y \tag{1}$$

I would use these commands:

```
\begin{equation}
x + 1 = y
\end{equation}
```

Notice that LaTeXautomatically centers your equation and adds a reference number. We can add a label so that we can refer to that equation later:

```
\begin{equation} \label{eu_eqn}
e^{\pi i} + 1 = 0
\end{equation}

Equation \ref{eu_eqn} is known as Euler's equation.
```

The code above should produce the following output:

$$e^{\pi i} + 1 = 0 \tag{2}$$

Equation 2 is known as Euler's equation.

3.3 Align Environment

Perhaps you want to line up equations on one element, like an equals sign. To create the following,

$$
\begin{aligned}
y &= 3.1415 \\
x + y &= 21.10 \\
x + (x+1) &= 5791.1 \\
x &= 0.05
\end{aligned}
$$

I would use these commands:

```
\begin{align*}
y&=3.1415 \\
x+y&=21.10 \\
x+(x+1)&=5791.1\\
x&=0.05
\end{align*}
```

If you try this now, you might get an error message. The `align` environment is part of a package called `amsmath`. If it's not already there, scroll up to the top of your document and add `\usepackage{amsmath}` to the preamble.

Can you figure out how to align on the decimal point instead?

$$y = 3.1415$$
$$x + y = 21.10$$
$$x + (x + 1) = 5791.1$$
$$x = 0.05$$

4   Final Notes

When you are satisfied with the preview of your document in ShareLaTeX, you can download the PDF to your computer using the icon next to the Recompile button.

This is only the very beginning of what you can do with LaTeX. The Reed LaTeX help page has great tutorials on making lists and tables, adding graphics, managing paper references using BibTeX, and LaTeXing your thesis. Another great way to learn more is to play with the templates available in ShareLaTeX.

Practice

Try creating the following math expression in a document, covering up the code below:

$$\frac{(x+\frac{1}{y})^m \cdot (x-\frac{1}{y})^n}{(y+\frac{1}{x})^m \cdot (y-\frac{1}{x})^n} = \frac{(\frac{xy+1}{y})^m \cdot (\frac{xy-1}{y})^n}{(\frac{xy+1}{x})^m \cdot (\frac{xy-1}{x})^n}$$

Here's the code:

```
\[
\frac{(x+\frac{1}{y})^{m}\cdot (x-\frac{1}{y})^{n}}{(y+\frac{1}{x})^{m}\cdot
(y-\frac{1}{x})^{n}} = \frac{(\frac{xy+1}{y})^{m}\cdot (\frac{xy-1}{y})^{n}}
{(\frac{xy+1}{x})^{m}\cdot (\frac{xy-1}{x})^{n}}
\]
```