

Latex Sample File

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This is an example of a paper written using the software LaTeX. It is intended to illustrate what LaTeX is good for and how to use it.

1 What is LaTeX?

LaTeX (pronounced lay-tech, and often written L^AT_EX), is typesetting software written and designed by Donald Knuth and Leslie Lamport. It can be used to write documents of any sort, but it was designed for mathematics and computer science.

The biggest difference between LaTeX and programs like Microsoft Word is that Word is a ‘WYSIWYG’ (What You See Is What You Get) editor and LaTeX is not. In Word you edit your document directly, as it will eventually appear. When you use LaTeX you edit a .tex file, and then typeset it to produce a nice looking PDF file. For example if you type this

```
\[
\frac{3}{5} \cdot x + \frac{2}{5} \cdot (1 - x) = \frac{2 + x}{5},
\]
```

then it will come out looking like this.

$$\frac{3}{5} \cdot x + \frac{2}{5} \cdot (1 - x) = \frac{2 + x}{5},$$
$$\frac{3}{2 + \frac{4}{7 + \frac{1}{1 + \frac{1}{2}}}} \cdot x + \frac{2}{\int_0^6 x^3 dx} \cdot (1 - x) = \frac{2 + x}{5},$$

Another feature of LaTeX is that it auto-numbers sections, definitions, examples, and so forth. For example:

Definition 1.1 1. A **sample space** is the set of all possible outcomes of a some process.

2. An **event** is any subset of the sample space.

Example 1.2 *Blah, blah, blah....*

Theorem 1.3 *Mathematics is fun!*

Proof: Obvious. \square

Let us now look at the LaTeX code which we used to produce this.

```
\begin{definition}\label{foo}
\begin{enumerate}
\item
A {\bf sample space} is the set of all possible outcomes of a some process.
\item
An {\bf event} is any subset of the sample space.
\end{enumerate}
\end{definition}

\begin{example}\label{bar}
Blah, blah, blah....
\end{example}

\begin{theorem}\label{baz}
Mathematics is fun!
\end{theorem}
\begin{proof} Obvious. \end{proof}
```

We did not have to worry about the numbers – LaTeX figures out how to number them for us. The labels are optional – we can leave out the part that says

```
\label{foo}
```

for example if we write

By Theorem `\ref{foo}`, we now know that...

then it ends up looking like this:

By Theorem 1.1, we now know that...

If we reorder everything, then it will get the numbers right automatically.

2 How to get started

Here is a suggested procedure for how to get started with using LaTeX.

- Download a program that can process LaTeX files (which will have a .tex extension) and can produce nice PDFs. This will consist of the LaTeX software itself, and it will often have nice additional features like a built-in text editor, spell checking, and so on.

There are many programs you can use, and most of them can be downloaded legally for free. (Indeed, most of them are open-source, so you can download the source code too if you like.)

For Macintosh, I personally use TeXShop which you can download here:

<http://pages.uoregon.edu/koch/texshop/>

I don't use Windows, so I don't personally know of a good LaTeX editor for that platform. You might try MiKTeX:

<http://www.miktex.org>

- Once you have downloaded something, I recommend that you start with this sample file and start by compiling it. Make sure that you get output matching what's on the web page!

After that, I would try making small tweaks and seeing what happens. There is a bunch of crap at the beginning which is probably confusing – you don't need to worry about what it means.

Within this sample file, you should ignore the parts which are labeled 'verbatim' (i.e., between begin verbatim and end verbatim). I used that to show LaTeX code in the final document without having LaTeX process it. This won't be relevant to your final project.

- For some changes, depending on your LaTeX editor you may need to compile the code *twice* to get it right.
- Here are some further resources:

<http://math.ucr.edu/~huerta/latexforbeginners.html>

In addition, I have posted the original LaTeX code for the course notes on the website, so you can read those too.

- Finally, **feel free to ask me for help!** If you have your work on a laptop, you are encouraged to bring it to class and ask me questions beforehand and afterwards.

2.1 A subsection

There's nothing here, but I added this so you can see how to add subsections if you like.

3 Some number theory examples

Here are a few number theory examples, so you can follow the formatting.

Here is the proof of Theorem 4 on p. 30 of Dudley [1].

Theorem 3.1 *If $ac \equiv bc \pmod{m}$ and $(c, m) = 1$, then $a \equiv b \pmod{m}$.*

Proof: From the definition of congruence, $m|(ac - bc)$; consequently, $m|c(a - b)$. Because $(m, c) = 1$, we can conclude from Theorem 5 of Section 1 that $m|(a - b)$. That is, $a \equiv b \pmod{m}$. \square

Here is an example of a table:

-	3	5	7	11	13	17	19	23	29
3	0	-1	-1	1	-	-	-1	1	-1
5	-1	0	-1	1	-1	-1	1	-	1
7	1	-1	0	-1	-1	-	-	-	-
11	-1	1	1	0	-1	-	-	-	-1
13	1	-1	-1	-1	0	1	-1	1	-1
17	-1	-1	-1	-1	-	0	-1	-1	-
19	1	1	-1	-1	-1	1	0	-1	-
23	-1	-1	1	1	1	-1	1	0	-
29	-1	1	1	-1	1	-1	-1	1	0

4 The bibliography

I included a sample of a bibliography at the end of the document. Each bibliographic item has a name and you can cite it like this [1]. The name you put inside the *bibitem* is not important and is just for your reference – you will cite it using the same name you give.

I do not care about bibliographic formatting and style. Please just make sure that the bibliography looks neat, and most importantly that **all** sources are credited. This includes web sources. Some samples follow below.

References

- [1] U. Dudley, *Elementary Number Theory*, second edition, Dover, 1978.
- [2] D. Madore, *A first introduction to p-adic numbers*, <http://www.madore.org/~david/math/padics.pdf>.