A Sample LaTeX Article

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April 15, 2016

Abstract

This a sample LaTeXdocument that explains some of the LaTeXcommands

1 Introduction

LaTeX is a markup language designed and implemented by **Leslie Lamport**, based on **Donald E. Knuth**'s typesetting language TeX. The markup in the source file of a LaTeX document my appear somewhat challenging, but the compiled result of the document is certainly a pleasing rendering of the mark-up material.

LaTeX was built on TeX's foundation. An article is divided into *logical units*, including an abstract, various sections and subsections, theorems, and a bibliography. The logical units are typed independently of one another. Once all the units have been typed, LaTeX controls the *placement* and *formating* of these elements. LaTeX automatically numbers the sections, theorems, and equations in your article, and builds the cross-references. If any changes is made to the article, it automatically renumbers its various parts and rebuilds the cross-references.

Packages are extensions of LaTeX. LaTeX commands, as a rule, start with a backslash (\) and tells LaTeXto do something special. For example, in the instruction `\emph{instructions to \LaTeX}` , `\emph` is a LaTeX command. Another kind of instruction is called an *environment*. For example, the commands `\begin{flushright}` and `\end{flushright}` enclose a `flushright` environment—texts that are typed inside this environment are right justified (lined up against the right margin) when typeset.

2 Typing Text

The following keys are used to type text in a LaTeX source file:

```
a-z  A-Z  0-9
+  =  *  /  ( )  [ ]
```

You may also use the following punctuation marks:

```
,  ;  .  ?  !  :  ‘  ’  -
```

and the spacebar, and the Return (or Enter) key.

There are thirteen special keys that are mostly used in LaTeX instructions:

```
#  $  %  &  ~  _  ^  \  { }  @  "  |
```

If you need to use them in your document, there are commands available for typesetting these special characters. For example, $ is typed as `\$`, the underscore (_) is typed as `\_`, and % is typed as `\%`, whereas ä is typed as `\"{a}`, and @ is simply typed `@`.

In a LaTeX source file, each *comment* line begins with %. LaTeX will ignore everything on the line after the % character.

The *document class*, declared by the command `\documentclass{..}`, in a LaTeX source file controls how the document will be formatted. LaTeX, by default, fully justifies the text by placing a certain size space between words—the *interword space*—and a somewhat larger space between sentences–the *intersentence space*. To force an interword space, you can use the \␣ command (the ␣ symbol indicates a blank space). The ~ (tilde) command also forces an interword space, but with a difference: it keeps words together on the same line. It is called a "tie" or "non-breakable space."

When LaTeX encounters a period, it must decide whether or not it indicates the end of a sentence. It uses the following rule: A period following a capital letter (e.g., A.) is interpreted

as being part of an abbreviation or an initial and will be followed by an interword space; otherwise, it signifies the end of a sentence and will be followed by an intersentence space. If this rule causes problems in your document, you can follow the period with `\␣` to force an interword space, or precede the period with `\@` to force an intersetence space.

In a LaTeX document source file, left double quotes are typed a ` ` (two left single quotes) and right double quotes are type as ' ' (two right single quotes). The left single quote key is usually in the upper-left or upper-right corner of the keyboard, and shares a key with the tilde (~) key.

In a LaTeX command that requires an argument, the argument follows the name of the command and is placed between { and }. Command names are *case sensitive*. The command `\\` (`\newline` is another form) breaks a line. You can use the `\\` command and specify an appropriate amount of vertical space, for example `\\[1in]`. Note that this command uses *square brackets* rather than braces because the argument is *optional*. The distance/spacing may be given in points(pt), centimenters(cm), or inches(in). To force a page break, use `\newpage`.

3 Typing Math

In addition to the keys listed above, you need the keys `|`, `<`, and `>` to type mathematical formulas. (`|` is the shifted `\` key on many keyboards).

There are two kinds of math formulas and environments:

1. *Inline math environments* open and close with $ or open with `\(` and close with `\)`.
2. *Displayed math environments* open with `\[` and close with `\]`. Other forms of the displayed environment are `\begin{equation*} ... \end{equation*}` and `\begin{equation} ... \end{equation}`.

Within the math environment, LaTeXuses its own spacing rules and completely ignores the number of white spaces typed with two exceptions:

1. Spaces that delimit commands (e.g., in `$\infty a$`, the space is not ignored; in fact, `\inftya$` is an error)

2. Spaces in the arguments of commands that temporarily revert to text mode (`\mbox` and `\text` are such commands).

In text mode, many spaces equal one space; whereas, in math mode, spaces are ignored (unless they terminate a command). To asjust the spacing in a typeset document, use a spacing command. The same formula may be typeset differently depending on whether it is inline or display. For example, $\sum_{i=1}^{n} i^2$ is inline math. The following is the same expression as displayed math

$$\sum_{i=1}^{n} i^2.$$

Math symbols are invoked by commands inside a math formula or environment. The math symbols are organized into tables in Appendix A of textbook. Some commands (e.g. `\sqrt`) need arguments enclosed in braces ({ and }). For example, to typeset $\sqrt{x^2y^2}$, type `$\sqrt{x^{2} y^{2}}$`. To typeset $\sqrt[n]{x^2y^2}$, type `$\sqrt[n]{x^{2} y^{2}}$`. Some commends need more than one arguments. For example to typeset

$$\frac{\sin x}{\cos^2 x + \tan x}$$

type

```
\[
   \frac{\sin x}{\cos^{2} x + \tan x}
\]
```

`\frac` is the command; $\sin x$ and $\cos^2 x + \tan x$ are the arguments.

Theorem 1 *This is the Pythagorean Theorem. It says*

$$x^2 + y^2 = z^2. \tag{1}$$

Definition 1 *Earth is where life is possible.*

4 References

Michael Downes *Short Math Guide for LaTeX*, AMS, 2002

George Gratzer, *First Steps in LaTeX*, Springer-Verlag, New York, 1999