

# Writing a L<sup>A</sup>T<sub>E</sub>X Article – The Basics

T. Stitz \*

## Abstract

Module 3 continues where Module 2 ended. L<sup>A</sup>T<sub>E</sub>X basics, such as spacing and markup structure are discussed. Common commands, environments, and declarations used when creating an article are introduced including lists, hyperlinks, and footnotes.

## 1 Some More Basics

### 1.1 Declarations

In the last module, we learned about a few declarations that use the *setlength* command. For some formatting commands, such as bold or italic, there is a command version and a declaration version. We will not need another command to set these declarations. The declaration will appear as a command. For example, the declaration for **bold** is `\bfseries`. A declaration will be true until another declaration of the same type is given or it is grouped within curly brackets (i.e. `{\it This is italic}`). Often declarations are used in an environment, so it will be true in the environment only. Some declarations can be global only.

In the last module, we used declarations using the *setlength* command (i.e. `\setlength{\parskip}{0.1in}`) and made the length an absolute value. In various modules, we will use measurements or parameters, such as `\baselineskip` and `0.5\textwidth`. `\baselineskip` is the width of a line and `0.5\textwidth` is half the width of the text on the page. In addition, you can use “rubber lengths” where the lengths will be  $\pm$  particular values. For more information, use (Kopka & Daly, 2004; Mittelbach, Goossens, Braams, Carlisle, & Rowley, 2004).

### 1.2 Spacing

In the last module, we discussed spacing basics. Another thing to keep in mind is that we have to be careful regarding horizontal space when using a command has no arguments. Remember, the first non-character ends the command. L<sup>A</sup>T<sub>E</sub>X considers a space a non-character.

To this end, the space after a command with no arguments is not translated as a space; however, it is considered a space when it treats multiple spaces in your .tex document as one space. Therefore, adding an additional space will not work. Often `\` is added at the end of the command in order to recognize the space after the command as a space.

The command `\textbackslash` typesets the `\` character. If there is punctuation after the backslash, you don't need to do anything. If you need a space after it, you would use `\textbackslash\`. The end of a line can be forced by using a “hard return,” `\`, which is often used in environments.

Many more declarations and commands can be found in (Kopka & Daly, 2004; Mittelbach et al., 2004). Bold and italic are used in Table 1.

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\*Applied Sciences Librarian, Phone: 330-972-6192, Fax: 330-972-7033, E-mail: [tstitz@uakron.edu](mailto:tstitz@uakron.edu)

Table 1: Example Syntax for Command and Declaration used for Formatting

Format	Command	Declaration
<b>Bold</b>	<code>\textbf{text}</code>	<code>{\bfseries text}</code>
<i>Italics*</i>	<code>\textit{text}</code>	<code>{\it text}</code>

\* *Emphasis* is usually italic unless redefined in class file, package or document, `\emph{text}` or `{\em text}`.

## 2 Lists

There are several list environments in  $\LaTeX$ . *Itemize* and *enumerate* will be discussed in this section.

### 2.1 Itemize

*Itemize* produces a bulleted type list and can be nested up to four times. Nesting occurs when another *itemize* environment is placed in an existing *itemize* environment.

The syntax for itemize is

```
\begin{itemize}
  \item Item 1

  %Nested
  \begin{itemize}
    \item Item 1
    ...
  \end{itemize}

  \item Item 2
  ...
\end{itemize}
```

The default label values are shown in this example.

- Module 1
  - What is  $\LaTeX$
  - Getting the Software
    - \* Error using Command Line Entry
    - \* Examples of  $\TeX$  Editors
      - $\TeX$ studio
      - LeD

The labels or “bullets” can be changed by changing the value of `\labelitem(level)`. The *level* represents the level of nesting: i, ii, iii, or iv. Try the following:

```
\renewcommand{\labelitemi}{+}
\renewcommand{\labelitemii}{\diamond}
\renewcommand{\labelitemiii}{\rightarrow}
\renewcommand{\labelitemiv}{\triangleright}
```

and you will change the list to

- + Module 1
  - ◊ What is  $\LaTeX$
  - ◊ Getting the Software
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      - ▷  $\TeX$ studio
      - ▷ LeD

*Renewcommand* changes the bullets for every itemized list for the remainder of the document.

Let's say this should be the bullets for some lists and not others. An environment could be created for this task. Basically, the syntax is `\newenvironment{name}{occurs before the environment}{occurs after the environment}`. Using the previous list as an example, the environment declaration would appear as follows.

```
\newenvironment{mylist}{\renewcommand{\labelitemi}{+}
\renewcommand{\labelitemii}{\diamond}
\renewcommand{\labelitemiii}{\rightarrow}
\renewcommand{\labelitemiv}{\triangleright}
\begin{itemize}}{\end{itemize}}
```

To use the environment, use *mylist* instead of *itemize*; otherwise, all else remains the same.

## 2.2 Enumerate

*Enumerate* produces an ordered (numbered) list with a possibility of four levels of nesting. You can nest *itemize* environments in *enumerate* environments and vice versa. You can still only use four levels of nesting total. The syntax is the same as *itemize* except *enumerate* is used. The default values are in this example.

1. Take Pre-Quiz
  - (a) Read Module Materials
    - i. Do Homework
      - A. Take Post-Quiz

The labels can be changed in a similar fashion as *itemize*, but there is an extra consideration with *enumerate* due to the counter. The label for *enumerate* is `\labelenum(level)` and the counter is `enum(level)`. Try the following:

```
\renewcommand{\labelenumi}{\Roman{enumi}.}
\renewcommand{\labelenumii}{\Alph{enumii}.}
\renewcommand{\labelenumiii}{\arabic{enumiii}.}
\renewcommand{\labelenumiv}{\alph{enumiv}.}
```

Notice the commands *Roman*, *Alph*, *arabic*, and *alph*. These commands inform  $\LaTeX$  of the format of the label. When the command begins with a capital letter, the label will appear in caps. Remember,  $\LaTeX$  is case sensitive. The new labels appear in this example.

- I. Take Pre-Quiz
  - A. Read Module Materials
    1. Do Homework
      - a. Take Post-Quiz

The counters can have a format that depends on previous exiting levels, section number, etc. Try the following:  
`\renewcommand{\labelenumiii}{\labelenumi\arabic{enumii}}`. *Labelenumi* was already in the appropriate format; thus, it was not changed. The new labels appear in this example.

1. Module 2 To Do List
  - 1.1. Take Pre-Quiz
  - 1.2. Read Module Materials
  - 1.3. Do Homework
  - 1.4. Take Post-Quiz

There are packages available for list formatting. For example, the *paralist* package offers new environments that adjusts spacing and position. The *enumitem* package enables easier label setting and it will be the package that we focus upon in this workshop.

The *enumitem* package makes it easier to change labels and continue numbers. The labels can be changed for all lists (globally) or just for particular lists (locally). For the global commands, use the commands in the preamble.

Globally

```
\setenumerate[1]{label=\Roman*.  
\setenumerate[2]{label=\Alph*.  
\setitemize[1]{label=$\bullet$  
\setitemize[2]{label=$\circ$
```

Locally

```
\begin{enumerate}[label=\Roman*.]
```

If you used the global commands in the preamble, it would mean that all numbered lists would use a capital roman numeral for the first level with a period after it. The second level would be a capital letter with a period after it. Bulleted lists would use a bullet for the first level and an small, open circle of the second level.

Notice that the `setenumerate` commands have the asterisk or `*` character. This represents the counter that is being formatted (i.e., `\Roman*` and `\Alph*`).

This list in particular example would make more sense applied to one list only. To get the same effect for one list, use the optional argument with `enumerate` and `itemize`.

- I. Level 1 is capital roman numerals
  - A. Level 2 is capital letters
    - Level 3 is a bullet
      - Level 4 is a small circle

*Enumitem* makes it easier to continue list numbering too. There is an optional argument called `continue` that can be used with `\begin{enumerate}`.

### 3 Hyperlinks

There are two packages that are often used to format and provide URLs: *url* and *hyperref*. The *url* package will allow correct word wrap of the URL when using PDF<sub>La</sub>TeX, but does not provide a hyperlink. The package *hyperref* automatically provides hyperlinks for internal cross-references, external URLs, and citations. It is suggested that *hyperref* is the last package that is declared, but that will not always be feasible. It might require some trial and error to determine if it can appear last. There are many options available with *hyperref* that are set using a key-value type of scenario (key=value). For a complete list of options, see (Kopka & Daly, 2004). The options can be declared with the package statement or using the *hypersetup* command.

By default, cross-references have a box with different border colors to indicate a hyperlink. The optional argument `colorlinks` is set to `false` by default. Often, it is desired to have hyperlinks appear as text of a particular color. To do so, `colorlinks` must be set to `true`. The command and the following arguments will set all the links to blue.

```
\hypersetup{colorlinks=true, linkcolor=blue, urlcolor=blue, citecolor=blue}
```

If the font appears different than the rest of the text, it might be necessary to set the URL font using `\urlstyle{same}`.

To display the URL, the `url` command is sufficient (i.e., `\url{URL}`). The `href` command can be used to link text to a URL (i.e., `\href{URL}{text}`). Internal links can be created by using `\label{label name}` and called within the document using `\ref{label name}` or `\pageref{label name}`. This document uses the `label` command for every section, go to section [1](#), [2](#), [3](#), or [4](#). Go to subsections [1.1](#), [1.2](#), [2.1](#), or [2.2](#).

## 4 Footnotes

Footnotes are produced by using the *footnote* command. By default, a superscript number will be generated and the footnote will appear in the footer of the page that the footnote is used. Footnotes can only be generated in normal paragraph mode, but there are several commands that can be used to make footnotes more flexible.

Symbols can be used instead of numbers. The *footnote* command has a label and a counter associated with it like *enumerate*. The *renewcommand* command can be used to change the footnote marks to symbols, `\renewcommand{\thefootnote}{\fnsymbol{footnote}}`. The sequence of symbols is as follows:

\* † ‡ § ¶ || \*\* †† ‡‡

When using symbols, the counter cannot generate more than 9. For footnote 10 and above, the optional argument must be used (i.e., `\footnote[1]{text}`). Footnotes can be placed in normally forbidden modes by using `\footnotemark[n]`, where *n* is the footnote number. In this example, I place a symbol footnote in a box, then change the footnote format back to numbers. The syntax is

```
\renewcommand{\thefootnote}{\fnsymbol{footnote}}
\mbox{This requires a footnote\footnotemark[2] and so does this\footnotemark[3]}
\footnotetext[2]{Here is the first footnote in the box.}
\footnotetext[3]{Here is the second footnote in the box.}
\renewcommand{\thefootnote}{\arabic{footnote}}
```

and the output is

This requires a footnote<sup>†</sup> and so does this<sup>‡</sup>

After returning the footnote markers to numbers, here is another footnote.<sup>1</sup>

Notice that the footnotes in the box did not affect the footnote counter. If `\footnotemark` was used without the option, then the counter would have incremented. In addition, using the options ensures that the correct footnote is associated with the footnote mark.

## References

- Kopka, H., & Daly, P. W. (2004). *Guide to L<sup>A</sup>T<sub>E</sub>X* (4th ed.). Boston: Addison-Wesley. Retrieved from <http://proquest.safaribooksonline.com/9780321617736>
- Mittelbach, F., Goossens, M., Braams, J., Carlisle, D., & Rowley, C. (2004). *The L<sup>A</sup>T<sub>E</sub>X companion* (2nd ed.). Boston: Addison-Wesley. Retrieved from <http://proquest.safaribooksonline.com/0201362996>

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<sup>†</sup>Here is the first footnote in the box.

<sup>‡</sup>Here is the second footnote in the box.

<sup>1</sup>First footnote after resuming the previous footnote notation.