What every (LA)TEX newbie should know

Barbara Beeton

TUG 2023

Source of the questions

- Years of fielding questions for authors at a math publisher and writing user documentation
- Questions raised on `tex.StackExchange`

Answers to questions

- Links at `https://tex.meta.stackexchange.com/q/2419`

Read the documentation

- This could be put on every slide.

Vocabulary

A few basic concepts

- What is a *template*?

  A template is a source file that is an outline, beginning with `\documentclass`, that contains a minimum of basic structural commands into which text and additional definitions can be inserted as appropriate.

  It is *not* the `\documentclass` itself.

Vocabulary

- The *command line* allows interaction with the compiler.

  `lualatex` ⟨*tex file*⟩ ⟨*optional directives*⟩

  Some corrections, e.g. fixing misspelled commands, can be done "on the fly", but remember to correct the source file too.
- The *log file* records all important information about a run, including all files read, and especially all errors and warnings. Find out how to look at it, and use it.

Telling LaTeX how to do something

Form of commands

- Commands (“control sequences”) begin with a \ (backslash).
  A control word consists only of letters (A-Z, a-z only) and terminates at a space or a non-letter — `\title`
  A control symbol consists of one non-letter — `\%`
- An environment defines a locally scoped element:

  ```
  \begin{⟨env-name⟩} ... \end{⟨env-name⟩}
  ```

  Error from a mismatched environment name:

  ```
  ! LaTeX Error: \begin{xxx} on input line nn
                 ended by \end{yyy}.
  ```

Telling LaTeX how to do something

Defining commands: best practices

- Use `\newcommand` or `\NewEnvironment`, not `\def`; there are also `\NewDocumentCommand` and `\NewDocumentEnvironment`.
- Avoid defining single-letter commands; many already exist.
- Don't use `\renewcommand` unless you know exactly what you're doing.

Bad example:

```
\renewcommand{\i}{\ensuremath{\sqrt{-1}}}
```

Author in bibliography: Brezis, Haïm

`Brezis, Ha\"{\i}m` $\Longrightarrow$ Brezis, Ha$\ddot{}\sqrt{-1}$m

Where am I on the page?

Modes

- Vertical mode: at beginning of page; after blank line;
  after explicit `\par`: `\par` is built into some environments.
- Horizontal mode:
  Regular text in paragraphs;
  after `\indent`, `\noindent` or `\leavevmode`.
  Multiple consecutive spaces are treated as a single space.
  An end-of-line (EOL) is treated as a space.
  Spaces at the beginning of a line are ignored.
- Math mode, in-text or display:
  Paragraph break (blank line or `\par`) is illegal in math mode

Spacing in text

Defaultsin the output

- Spaces are “natural width” when text is ragged right.
- Spaces that end sentences are wider than interword spaces in U.S. documents (turn off with `\frenchspacing`):
  Example: A sentence. Another sentence. A third sentence.
- To avoid too-wide space after an abbreviation (except at the end of a sentence), follow it by “\ ” (backslash-space):
  `abc vs.  xyz` (abc vs. xyz) vs. `abc vs.\ xyz` (abc vs. xyz)
- If the line shouldn’t break there, follow the period by ˜ (tilde):
  `as seen on p.~23.` (as seen on p. 23.)

Spacing in text

Spurious spaces in definitions

- Use % to suppress such spaces;
  % starts a comment and ends a line without an EOL.
- An example of spaces in a definition:

```
\newcommand{\abc}{
     \emph{abc def}
  }
```

word *abc def* word

```
\newcommand{\abc}{%
     \emph{abc def}%
  }
```

word *abc def* word

Spacing in text

Spurious spaces in the source text

- Extra spaces caused by multiple indexing terms

```
Start a topic\index{abc}  Start a topic\index{abc}%
\index{def}               \index{def}%
\index{xyz}               \index{xyz}
and continue.             and continue.
Start a topic  and continue.   Start a topic and continue.
```

- These spaces are no longer contiguous.
- Remember to leave *one* space.

Spacing in text

An unexpected space caused by a package

A text with \usepackage{colorbox} had a colorized letter surrounded by spaces in the middle of a word. Oo p s! A small frame was applied around the colored element by the package:

```
\usepackage{colorbox}
\newcommand{\pink}[1]{%
  \colorbox{red!20}{#1}}
Oo\pink{p}s!
```

Oo p s!

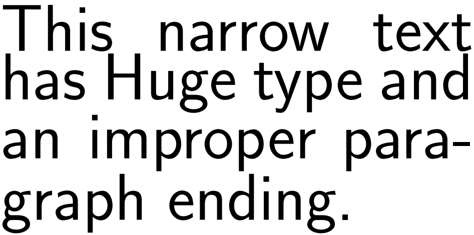
```
\renewcommand{\pink}[1]{{%
    \fboxsep=0pt
    \colorbox{red!20}{#1\strut}}}
Oo\pink{p}s!
```

Oops!

Ending a paragraph

- A paragraph ends with a blank line or an explicit `\par`.
- A paragraph does *not* end with `\\`.
- When a paragraph ends, font sizes and baselines are frozen; an improper paragraph ending can cause unexpected results.

```
\setlength{\textwidth}{6.25cm}
\Huge This narrow text has
Huge type and an improper
paragraph ending.\\
```



This narrow text
has Huge type and
an improper para-
graph ending.

More about \\

- Error if \\ starts a line in vertical mode:
  ```
  ! LaTeX Error: There's no line here to end.
  ```
- Warning if line ending with \\ is very short:
  ```
  Underfull \hbox (badness 10000) in paragraph at ...
  ```
  This may be okay, but check.
- Error if \\ is followed by something in brackets [...]
  that is meant to be typeset:
  ```
  ! Missing number, treated as zero.
  ```
  [...] is defined to indicate a vertical distance to be skipped;
  insert \relax before the opening bracket.
- \newline is often a reasonable alternative to break a line.

More about \\

What is \\ to be used for?

- Ending lines of poetry.
- Ending rows in a `tabular` or `tabbing` environment.
- Separating lines in a multi-line math display.

Vertical mode, between paragraphs

What commands should appear between paragraphs, not in text?

- Floats — figures and tables, also algorithms.
  In addition, the source of a float should occur in the file
  before the first word of text typeset on the same page;
  this is mandatory on two-column pages and always a good idea.
- Commands for additional vertical space — `\vspace` or `\vskip`.
- But display math is part of the preceding paragraph,
  so don't leave a blank line before it.
  That can lead to an unwanted page break.

Font changes

Font changes with limited scope

- A change of limited scope can be effected by a command like `\textit{...}` or `\textbf{...}`.
- The command `\emph{...}` “reverses” the current style:
  in an upright environment, the emphasized text becomes italic,
  in an italic environment, it becomes upright.
- Within a “closed” environment, even a persistent font change will go away when the environment ends.

Font changes

Persistent font changes

- Persistent font changes are usually meant to be used within "closed" environments like `theorem` or `minipage`.
- These changes have names like `\itshape`, `\bfseries`, and `\sffamily`.
- Since the naming is not obviously consistent, it's best to look them up in a good user guide.

Commercial break *The LaTeX Companion*, 3rd edition

A brief look at math

By definition, math is a closed environment

- Math must be entered and exited explicitly.
- In text, use `$...$` or `\(...\)`.
- In display, for a one-line unnumbered equation, use `\[...\]`; for a numbered or multi-line display, use an environment from amsmath or mathtools.
- Read the user guides for these packages.
- mathtools loads amsmath, so only `\usepackage{mathtools}`.

A brief look at math

Some “don’t”s

- Don’t use `eqnarray`.
  If an equation is long and numbered, the number will overprint the equation.
- Don’t leave a blank line in math, either in-text or display;

  ```
  ! Paragraph ended before [...] was complete.
  ! Missing $ inserted.
  ```
- If some visual space is wanted in the input to make it easier to read, put a % at the beginning of the line.

Organizing your document

- Choose an appropriate document class.
  If this is to be submitted for publication, use what the publisher recommends.
- Don't blindly borrow someone else's source, no matter how much you like the output.
- Organize the preamble, grouping related packages (fonts, math, . . .); if needed, hyperref should be loaded last, with few exceptions.
- Don't load the same package more than once;
  be aware of packages that are preloaded by other packages.
- If `\RequirePackage` is needed, it goes before `\documentclass`.
- Read the documentation.

Wrapping up

- Make sure you can find the log file.
  It will contain all details of errors and warnings.
- Always correct the first error first.
  Some errors cause many more errors.
  Phony errors will disappear once the first one is fixed.
- Delete derived files: `.aux`, `.toc`. etc.,
  if the log indicates that an error is found there.
- If it's an option, consider compiling interactively.
  This makes it possible to fix some errors right away.
  If you do, be sure to fix the source as well.
- Read the documentation.