More Latex

Sebastiano Tronto

2021-03-12

UNIVERSITÉ DU LUXEMBOURG

Theorems (review)

`\newtheorem{env-name}[number-with]{Text}[number-parent]`

- `env-name`: Environment name (use `\begin{env-name}...`)
- `Text`: Theorem name to be displayed
- `[number-with]` for "shared counter"
- `[number-parent]` adds x.1
- At most one of `[number-with]` and `[number-parent]`

UNIVERSITÉ DU LUXEMBOURG

Theorems (review)

```
\newtheorem{theorem}{My Theorem}[section]
\newtheorem{pr}[theorem]{Proposition}

\theoremstyle{definition}
\newtheorem{defin}{New definition}[section]
\newtheorem{cor}{Corollary}[theorem]

\theoremstyle{remark}
\newtheorem*{warning}{Achtung}

⋮

\section{Second section}

\begin{theorem} Important Fact \end{theorem}
\begin{cor} Follows from Important Fact \end{cor}
\begin{defin} A new concept \end{defin}
\begin{warning} Don't make this mistake! \end{warning}
\begin{pr}[Gauss] Another fact \end{pr}
```

2 Second section

My Theorem 2.1. *Important Fact*

Corollary 2.1.1. Follows from Important Fact

New definition 2.1. A new concept

Achtung. Don't make this mistake!

Proposition 2.2 (Gauss)**.** *Another fact*

UNIVERSITÉ DU LUXEMBOURG

Counters

Reference: `https://en.wikibooks.org/wiki/LaTeX/Counters`

- Sections, theorems etc have an associated *counter*
- Common usage:

```
\setcounter{counter-name}{n}    %Set counter to n
\addtocounter{counter-name}{n}  %Add n to counter
```

UNIVERSITÉ DU LUXEMBOURG

Counters

- Define a counter with `\newcounter{name}[number-parent]`
- Change sub-numbering of defined counters:

```
\numberwithin{equation}{section}
```

- Print formatted counter with `\thename` or just number with `\arabic{name}` (or `\alph`, `\Alph`, `\roman`, `\Roman`, `\fnsymbol`)

UNIVERSITÉ DU LUXEMBOURG

Counters

Default counters

- chapter
- section
- subsection
- subsubsection
- paragraph
- page
- figure
- footnote
- equation
- enumi
- enumii
- ...

Counter styles

`arabic`	1, 2, 3, 4...
`alph`	a, b, c, d...
`Alph`	A, B, C, D...
`roman`	i, ii, iii, iv...
`Roman`	I, II, III, IV...
`fnsymbol`	$*$, †, ‡, § ...

Counters: change \thecounter

- Change how counter is displayed by default, for example:

```
\renewcommand{\thesection}{\alph{section}}
```

- For enumerate:

```
\usepackage{enumitem}
\begin{enumerate}[label=\alph*]
```

UNIVERSITÉ DU LUXEMBOURG

label and ref

- Put \label{mark} immediately after the thing you want to refer to (after \refstepcounter{countername} for counters you define)
- Use \ref{mark} or \eqref{mark} to refer (Pro tip: write Proposition~\ref{mark})
- Compile twice!

UNIVERSITÉ DU LUXEMBOURG

The hyperref package

```
\usepackage{hyperref}
```

- Now all `\ref{mark}` become clickable!
- `\hyperref[mark]{text}` for internal links
- `\url{www.google.com}` or `\href{www.google.com}{Google}` for web links

UNIVERSITÉ DU LUXEMBOURG

New commands

- We have seen `\newcommand{\command}{output}`
- Arguments: use `\newcommand{\command}[n]{output}` and use the arguments in output with `#1, #2, ... #n` ($n \leq 9$)
- If `\command` is already defined: `\renewcommand` (overwrite) or `\providecommand` (use old definition, if it exists)

New commands - examples

```
\newcommand{hi}{Hello, World!}
\hi
```

Hello, world!

```
\newcommand{hello}[1]{Hello, #1!}
\hello{my friend}
```

Hello, my friend!

```
\renewcommand{binom}[2]{bin(#1,#2)}
\( \binom{10}2 \)
```

$bin(10, 2)$

UNIVERSITÉ DU LUXEMBOURG

New commands - optional argument

```
\newcommand{\com}[n][default1]{output}
\com[first]{other,args} or \com{without,first}
```

- At most one optional argument, must be `# 1`
- More complex things: use TeX primitives such as `\ifthenelse` or see `https://www.ctan.org/tex-archive/support/newcommand/`

UNIVERSITÉ DU LUXEMBOURG

Exercises

1. Write a command `\mat` which takes 4 arguments and outputs a 2×2 matrix with those arguments as entries (use `pmatrix`).

2. Write a command to define a function case-by-case (2 cases, 4 arguments). Use the `cases` environment:

```
\begin{cases}
  1 & 2 \\  3 & 4
\end{cases}
```

$\Longrightarrow$

$$\begin{cases} 1 & 2 \\ 3 & 4 \end{cases}$$

UNIVERSITÉ DU LUXEMBOURG

Pictures

```
\usepackage{graphicx}
\includegraphics[options]{picture.jpg}
```

Options (comma-separated) include:

- `scale=x` (scale by a factor of x)
- `width=x` and `height=y` (if both specified picture is distorted)
- `angle=`α (rotate)

Figures

```
\begin{figure}[place]
```

- Figure outside normal text flow.
- `place`: `h` (here), `t` (top) or `b` (bottom).
- Can add *caption*

```
\begin{figure}[h]
    \centering      % recommended
    \includegraphics{picture.jpg}
    \caption{Description of the picture}
\end{figure}
```

UNIVERSITÉ DU LUXEMBOURG

Wrapping text around figures

```
\usepackage{wrapfig}
\begin{wrapfigure}{alignment}{width}
```

- `alignment`: `l` (left) or `r` (right)
- Must specify `width`
- Works the same as `figure`

```
\begin{wrapfigure}{l}{0.5\textwidth}
    \centering
    \includegraphics{picture.jpg}
    \caption{Description of the picture}
\end{wrapfigure}
```

Lengths

Reference: `https://en.wikibooks.org/wiki/LaTeX/Lengths`

- Similar to counters:

```
\newlength{\lengthname}
\setlength{\lengthname}{value}
```

- `value`: number followed by unit (`12pt`, `1.2cm`, `65mm`, ...)

Lengths

Default lengths:

- `\textwidth`: width of text in a page
- `\textheight`: height of text in a page
- `\baselineskip`: space between lines in same paragraph
- `\parskip`: space between paragraphs
- `\parindent`: indentation of first line of a paragraph
- ...

Manual spacing

- \vspace{length} and \hspace{length}
- Fill space: \vfill and \hfill
- Fill line with "decoration": \hrulefill and \dotfill
- Example:

```
First name: \hrulefill \quad Last name: \hrulefill
```

UNIVERSITÉ DU LUXEMBOURG

Bibliography

Simple bibliography with `thebibliography` environment:

```
\begin{thebibliography}{99}
    \bibitem{knuth68}
        Donald Knuth, The Art of Computer Programming,
        Volume I, 1968, Addison-Wesley
\end{thebibliography}
```

UNIVERSITÉ DU LUXEMBOURG

Bibligraphy

- Simple citation: `\cite{knuth68}`
- Cite multiple sources: `\cite{source1, source2}`
- Cite specific part with `\cite[p.~42]{source}`

UNIVERSITÉ DU LUXEMBOURG

Bibliography: BibTeX

- Separate file `mybib.bib`, different syntax:

```
@book{knuth68,
    author = "Donald Knuth",
    title = "The Art of Computer Programming",
    publisher = "Addison-Wesley",
    volume = "I",
    year = "1968",
}
```

- Include bibliography in your `.tex` file:

```
\bibliographystyle{plain}
\bibliography{mybib}
```

UNIVERSITÉ DU LUXEMBOURG

Bibliography: BibTeX

- Compile, generate bibliography, compile, compile
- Books in `.bib` file but not cited do not appear
- Citing articles and other: see `https://en.wikibooks.org/wiki/LaTeX/Bibliography_Management#Standard_templates`
- Find BibTeX citations on `https://scholar.google.com`

UNIVERSITÉ DU LUXEMBOURG