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Scientific Computing 372

L^AT_EX §5: Boxes and new environments

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Schedule

- 1 Introduction and setting text
- 2 Setting mathematics
- 3 Standard environments
- 4 Tables and figures
- 5 Boxes and new environments
- 6 AMS-LATEX
- 7 Beamer and PGF

Little boxes

L–R boxes

- L–R means left-to-right, won't break into paragraphs
- Use `\makebox[⟨width⟩][⟨alignment⟩]{⟨contents⟩}`

Example

```
A \makebox[3cm]{centre} aligned box. \\
A \makebox[3cm][l]{left} aligned box. \\
A \makebox[3cm][r]{right} aligned box. \\
```

```
A      centre      aligned box.
A left              aligned box.
A              right aligned box.
```

Little boxes

Example (Keeping it together)

- Use `\mbox{<contents>}`

Compare $|x - \operatorname{erff}|/2$,
for example, with $|x -$
`\mbox{erff}|/2`.

Compare $|x - \operatorname{erff}|/2$, for
example, with $|x - \operatorname{erff}|/2$.

Example (Raising or lowering it)

- Use `\raisebox{<distance>}{<contents>}`

It is very easy to slightly
`\raisebox{2mm}{\em raise`
`text}` (a split infinitive!)
or `\raisebox{-2mm}{lower`
`text}`, really.

It is very easy to slightly
raise text (a split infinitive!) or
lower text, really.

Framing it

Framed boxes

- Use `\framebox[⟨width⟩][⟨alignment⟩]{⟨contents⟩}`

Example

```
A \framebox[3cm]{centre} framed box. \\
```

```
A \framebox[3cm][l]{left} framed box. \\
```

```
A \framebox[3cm][r]{right} framed box. \\
```

A

centre

 framed box.

A

left

 framed box.

A

right

 framed box.

Drawing rules


Rules

- Use `\rule[⟨distance⟩]{⟨x dimension⟩}{⟨y dimension⟩}`

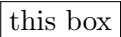
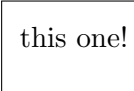
Example

Rule 1: `\rule{1mm}{5mm}` Rule 2: `\rule[4mm]{20mm}{3mm}`

Rule 3: `\rule[-4mm]{30mm}{5mm}`

Rule 1:  Rule 2:  Rule 3: 

Example (Rules with zero height or width)

Compare  this box with  this one!

The trick: `\framebox{\rule[-0.5mm]{0cm}{1cm} this one!}`

Paragraph boxes

Paragraph boxes

- Use `\parbox[⟨alignment⟩]{⟨width⟩}{⟨contents⟩}`
- Allows normal text flow, unlike LR boxes

Example

```
\parbox[b]{4cm}{This paragraph box is aligned by its  
bottom line,} \hfill while \hfill  
\framebox{\parbox[t]{5cm}{this framed one is aligned  
by its top line.}}
```

This paragraph box is aligned by its bottom line,

while

this framed one is aligned by its top line.

Saving it for later

Saved boxes

- Declare the box with `\newsavebox{\langlebox name\rangle}`
- Save contents with `\savebox{\langlebox name\rangle}[\verb\langlewidth\rangle]{\langlecontents\rangle}`
- Place with `\usebox{\langlebox name\rangle}`
- Note the slash `\` before the box name

Example

```
\newsavebox{\bugs}  
\savebox{\bugs}[4cm]{flies and mosquitoes}  
Bugs like \usebox{\bugs} are everywhere  
in Mpumalanga.
```

Bugs like flies and mosquitoes are everywhere in Mpumalanga.

Bibliographies and Citations

- Two ways of handling bibliographies
 - 1 Employ `BIBTEX`, an external program
 - Use `\bibliography{<bib file>}`
 - `<bib file>` is a specially-formatted file with the `.bib` extension
 - 2 Use the `thebibliography` environment
 - Has a mandatory argument for the width of the key:
`LATEX` computes the boxed width of this argument, so use 0 for up to 9 references, 00 for up to 99, etc.
 - Use `\bibitem{<key>} <reference>` to list works
- Both methods declare a *citation key* for each reference
- Use `\cite[<note>]{<key list>}` to cite works, where
 - `<note>` is a note, e.g., page numbers
 - `<key list>` is a comma-separated subset of the available reference keys

Example (Doing it yourself)

Two of my favourite text books `\cite{cohn,griffiths}` agree that `\ldots`.

```
\begin{thebibliography}{0}
```

```
\bibitem{cohn} P. M. Cohn. 2003. \emph{Basic Algebra: Groups, Rings and Fields}. Berlin: Springer-Verlag.
```

```
\bibitem{griffiths} David J. Griffiths. 1999.
```

```
\emph{Introduction to Electrodynamics}. Third Edition. Upper Saddle River, NJ: Prentice Hall.
```

```
\end{thebibliography}
```

Two of my favourite text books [1, 2] agree that

[1] P. M. Cohn. 2003. *Basic Algebra: Groups, Rings and Fields*. Berlin: Springer-Verlag.

[2] David J. Griffiths. 1999. *Introduction to Electrodynamics*. Third Edition. Upper Saddle River, NJ: Prentice Hall.

Example (BIBTEX file format)

```
@ARTICLE{bachA,  
  author = {A {Bachem} and W {Hochstattler} and M {Mallich}},  
  title = {The simulated trading heuristic for vehicle routing  
  problems},  
  journal = {Discrete Applied Mathematics},  
  volume = {65(1--3)},  
  pages = {47--72},  
  month = {March},  
  year = {1993} }  
  
@INBOOK{antTSP,  
  author = {Marco {Dorigo} and Thomas {Stutzle}},  
  chapter = {\textit{Chapter 9: The Ant Colony Optimization  
  Metaheuristics: Algorithms, Applications, and Advances}},  
  title = {Handbook of Metaheuristics},  
  pages = {250--285},  
  year = {2003},  
  publisher = {Springer New York} }
```

New commands

Defining new commands

- Use `\newcommand{<name>}[<number of arguments>]{<text>}`
- `<name>` must start with `\`
- To “place” arguments in `<text>`, use `#<number>`
- In general, use `\newcommand` only in the preamble

Example

```
\newcommand{\vlong}{very long, silly piece of text}
```

```
\newcommand{\der}[2]{\frac{d#1}{d#2}}
```

A `\vlong` sometimes precedes a derivative, where the latter might be `\der{x}{y}` or `\der{\phi}{t}`.

A very long, silly piece of text sometimes precedes a derivative, where the latter might be $\frac{dx}{dy}$ or $\frac{d\phi}{dt}$.

New environments

Defining new environments

- `\newenvironment{<name>}{<begin text>}{<end text>}`
- `<name>` has *no* `\`
- Use like any other environment
- In general, use `\newenvironment` only in the preamble

Example

```
\newenvironment{emitemize}{\begin{itemize} \em}
{\end{itemize}}
\begin{emitemize}
\item First emphasised item
\item Second emphasised item
\end{emitemize}
```

- *First emphasised item*
- *Second emphasised item*

New theorems

New (numbered) theorem-like environments

- `\newtheorem{<name>}{<caption>}[<numbered within>]`
- `\newtheorem{<name>}[<numbered like>]{<caption>}`
- In general, use `\newtheorem` only in the preamble

Example

```

\newtheorem{theorem}{Theorem}
\newtheorem{guess}[theorem]
{Conjecture}
\begin{guess}[Wiles, 1985]
There do exist integers
 $n > 2$ ,  $x$ ,  $y$ , and  $z$  such
that  $x^n + y^n = z^n$ .
\end{guess}
\begin{theorem}[FLT]
There are no integers  $n > 2$ ,
 $x$ ,  $y$ , and  $z$  such that
 $x^n + y^n = z^n$ .
\end{theorem}

```

Conjecture 1 (Wiles, 1985)

There do exist integers $n > 2$, x , y , and z such that $x^n + y^n = z^n$.

Theorem 2 (FLT)

There are no integers $n > 2$, x , y , and z such that $x^n + y^n = z^n$.

Conjecture 3 *Don't count your chickens before they hatch.*

Setting counters

Counters

- `\newcounter{<counter>}[<within>]`
- `\setcounter{<counter>}{<number>}`
- `\addtocounter{<counter>}{<number>}`
- Use `\the<counter>` to print the counter value
- Format with `\arabic`, `\roman`, `\Roman`, `\alph`, and `\Alph`

Example

```
\newcounter{bean} \setcounter{bean}{13}
\renewcommand{\thebean}{\Roman{bean}-\arabic{bean}}
This is bean \thebean. \addtocounter{bean}{4}
This is bean \thebean\ now.
```

This is bean XIII-13. This is bean XVII-17 now.

Setting lengths

Lengths

- `\newlength{<command>}`
- `\setlength{<command>}{<length>}`
- `\settowidth{<command>}{<text>}`

Example

```
\newlength{\play} \setlength{\play}{3cm}
Here is some \hspace{\play} space. \\
\settowidth{\play}{Pythagoras}
We use the theorem of \hspace{\play} to calculate\ldots. \\
\settowidth{\play}{We use the theorem of}
\hspace*{\play} Pythagoras
```

Here is some space.

We use the theorem of to calculate....

Pythagoras