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## 1. INTRODUCTION

The DocumentClass *alittlebear.cls* aims to provide a simple and easy template for writing math notes on latex. The link to *alittlebear.cls*, *Example.tex*, and *Template.tex* can be found at <https://github.com/a-little-bear/Latex-Template>.

Here is the template of a new tex file:

```
\documentclass[12pt]{alittlebear}

\def\name{}
\def\course{}
\def\headername{}
\def\headernum{}

\begin{document}

\end{document}
```

## 2. SETTINGS

### 2.1. Document Preamble.

```
\documentclass[#pt]{alittlebear}
    #: font size in {10,11,12}, in pt

\def\name{#}
    #: author name

\def\course{#}
    #: course name

\def\headername{#}
    #: header name

\def\headernum{#}
    #: header number
```

### 2.2. Document Class.

```
\skippar{5pt}
    Space between paragraphs, Default: 5pt

\indentpar{0pt}
    Indentation of the first line of a paragraph, Default: 0pt

\def\maincolor{brown}
    Main color, Default: brown

\marginsize{0.5in}
    margin of the pages, may change to 0.5in 1in etc

\thmstyle{definition}
    Theorem style from asmthm, Default: definition
```

## 3. COMMANDS

## 3.1. Formatting Commands.

`\indenv[2][1]{\begin{adjustwidth}{#1cm}{}}#2\end{adjustwidth}}`

Indented environment, use package *changepage*

Example: `\indenv{`

This is an indented environment (multiple paragraphs)

`}`

`\indenv[10]{`

This is an indented environment with 10mm indentation

`}`

`\ind[1][5]{\hspace*{#1mm}}`

#1: indentation, Default: 5mm

Example: `\ind{`

This is an indented paragraph

`}`

`\ind[10]{`

This is an indented paragraph with 10mm indentation

`}`

`\unind[1][5]{\hspace*{#1mm}}`

#1: unindentation, Default: -5mm

`\explain[2][20]{\ind[1]{#2}}`

#1: indentation, Default: 20mm, #2: explanation

`\np{\newpage}`

`\ds{\displaystyle}`

`\bb{\mathbb}`

`\cal{\mathcal}`

`\scr{\mathscr}`

`\frak{\mathfrak}`

`\bf{\mathbf}`

shortcut for math fonts command

`\tit{\textit}`

`\trm{\textrm}`

`\tsf{\textsf}`

`\ttt{\texttt}`

`\tsc{\textsc}`

`\tbf{\textbf}`

shortcut for text fonts command

### 3.2. TColorBox Commands.

`\qbreak`

End the question and follow by the proof / solution

`\envbreak`

And a separator line within an environment

`\tcbcnt`

Set the counter for tcolorbox theorem environment

`\retcbcnt`

Reset the counter for tcolorbox theorem environment

`\newn, \newm`

New notitle tcolorbox

Example: `\newn{`

`This is a new notitle "note" tcolorbox`

`}`

`\newm{`

`This is a new notitle "mathnote" tcolorbox`

`}`

`\newh, \newr, \newp`

New asmathm theorem tcolorbox environment with prefixes

Example: `\newh{`

`This is a new "hint" asmathm tcolorbox environment`

`}`

`\newr{`

`This is a new "remark" asmathm tcolorbox environment`

`}`

`\newp{`

`This is a new "proof" asmathm tcolorbox environment`

`}`

`\newq, \newcl, \newd, \newco, \newt, \newl, \newe, \newu, \newch`

New TColorBox theorem environment with titles

Example: `\newq[optional: #EnvName]{#label}{`

`This is a new "question" tcolorbox theorem environment`

`}`

`\newcl[optional: #EnvName]{#label}{`

`This is a new "claim" tcolorbox theorem environment`

`}`

`\newd[optional: #EnvName]{#label}{"definition"}`

`\newco[optional: #EnvName]{#label}{"corollary"}`

`\newt[optional: #EnvName]{#label}{"theorem"}`

`\newl[optional: #EnvName]{#label}{"lemma"}`

`\newe[optional: #EnvName]{#label}{"exercise"}`

`\newu[optional: #EnvName]{#label}{"unit"}`

`\newch[optional: #EnvName]{#label}{"chapter"}`

`\ref{#1:#label}`

Use ref to reference the environment, where #1:#label e.g. is "question:q1"

`\tbox[optional:#1]{#2}`  
optional #1 define more options, #2 is the centered title

### 3.3. Math Commands.

`\numberthis`

Add the line number in unnumbered math environment

`\T[1]{\text{#1}}`

Abbreviation of `\text{}`

`\A1[3]{#1 &=#2 &\text{#3}&&\}`

(left) = (right) + (explanation)

`\cd{\cdot}`

Abbreviation of `\cdot`

`\st{\text{\_s.t.\_}}`

Abbreviation of `\text{ s.t. }`

`\ie{\text{\_i.e.\_}}`

Abbreviation of `\text{ i.e. }`

`\alt[1]{\intertext{#1}}`

Insert line between align math equations, `\` included

`\bb[1]{\mathbb{#1}}`

`\cal[1]{\mathcal{#1}}`

`\sc[1]{\textsc{#1}}`

More shortcuts for `mathbb`, `mathcal`, `textsc`

`\D{\mathop{}}\!\!\mathrm{d}`

d symbol for differentiation, example: `\D x`

`\DD[2]{\frac{\D #1 }{\D #2}}`

Leibniz's notation of differentiation, example: `\DD{x}{y}`

`\vspan{span}`

span in linear algebra, Math Operator

`\rank{rank}`

rank in linear algebra, Math Operator

`\im{im}`

image in linear algebra, Math Operator

`\sgn{sgn}`

defined math operator `sgn` as the sign function

### 3.4. Symbol Abbreviations.

```

\C -> \mathbb{C} == complex
\R -> \mathbb{R} == reals
\Q -> \mathbb{Q} == rationals
\Z -> \mathbb{Z} == integers
\N -> \mathbb{N} == naturals
\F -> \mathbb{F} == field

\al -> \alpha
\be -> \beta
\ga -> \gamma
\Ga -> \Gamma
\ep -> \varepsilon
\de -> \delta
\sig -> \sigma
\Sig -> \Sigma
\p -> \partial

\? -> \stackrel{?}{=} == question mark on equal sign
\ra -> \rightarrow == rightarrow (single line)
\Ra -> \Rrightarrow == Rrightarrow (double lines)
\is -> \equiv == equivalent (triple lines)
\injective \surjective \bijective

\arr = angle brackets
\bra = parenthesis ( )
\sqrbra = square brackets []
\curbra = curly brackets {}
\abs = absolute value | |
\norm = double absolute || ||
\ceil = ceiling + ( ) + ceiling
\floor = floor + ( ) + floor
\near = floor + ( ) + ceiling

\func[3]{#1: #2 \rightarrow #3} == function (name, domain, codomain)
\Pset{#} -> \mathcal{P}(#) == power set
\Relate{#}{##} -> #\mathcal{R}## == relation
\GF[1][2]{\bb{F}_{#1}} == Galois field, default #1 = 2
\modulo[1][n]{\Z/#1\Z} == modulo, default #1 = n

\P -> \mathbb{P} == primes
\nil -> \varnothing == empty set
\O -> \mathcal{O} == big O
\relate -> \mathcal{R} == relate (relation)

```

## 4. OTHER NOTABLE COMMANDS

```
\renewcommand{\qedsymbol}
{$_{\scriptstyle \substack{\sc{quod}}\sc{erat}}\sc{dem}}
\scalebox{0.53}{\blacksquare}}}
```

Modified QED symbol

```
\lstnewenvironment{CPP}{\lstset{language=C++}}{}
```

New environment for C++ et al code listing

Example (CPP = C++, Cl = C):

```
\begin{CPP}
  hi
\end{CPP}
```



## 5. KNOWN BUGS / IMPROVEMENTS

- 1) Nest chapter, exercise, unit together are unlikely to work.
- 2) To improve readability, the environments should try to not be nested.
- 3) Extend listings and tikzpictures.
- 4) The number counters cannot align with section numbers.
- 5) The color box sometimes touches the footer.
- 6) Make sure use `\np` or `\newpage` for new exercise/unit/chapter so that the page splitting functions properly.