

# Description of the module Fancy Theorems

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## Abstract

With the module *Fancy Theorems* you can modify all the theorems layouts output appearance (except the proof and case layouts), using a key-val syntax much like in thmtools. All the theorems environments are defined using the L<sup>A</sup>T<sub>E</sub>X package **fancythm**, which rely heavily on the L<sup>A</sup>T<sub>E</sub>X package **thmtools**. It is recommended to read some of **thmtools** documentation.

## Contents

<b>1. Preparation</b>	<b>2</b>	4.2. Bilingual Documents . . . . .	9
1.1. Installation . . . . .	2	<b>A. Documentation of fancythm</b>	<b>10</b>
1.2. Loading The Module . . . . .	2	A.1. Initialization . . . . .	10
<b>2. Basics</b>	<b>2</b>	A.2. Keys . . . . .	10
2.1. Designing Theorems . . . . .	2	A.3. Defaults . . . . .	13
2.2. The templates Option . . . . .	3	A.4. Theorems Deceleration . . . . .	14
2.3. List of Theorems . . . . .	4	A.5. List of Theorems . . . . .	15
<b>3. Detailed Information</b>	<b>4</b>	<b>B. Documentation of fancythm-styles</b>	<b>17</b>
3.1. Theorems Keys . . . . .	4	B.1. Initialization . . . . .	17
3.2. Layouts Information . . . . .	7	B.2. Tcbset . . . . .	17
3.3. List of Theorems Keys . . . . .	8	B.3. RTL switches . . . . .	22
3.4. Keys - templates option . . . . .	9	B.4. Style Keys . . . . .	23
<b>4. Bilingual And RTL Documents</b>	<b>9</b>		
4.1. RTL Documents . . . . .	9		

# 1. Preparation

## 1.1. Installation

Firstly, manually install the `fancythm` package. The installation procedure is dependent on your  $\text{\LaTeX}$  distribution, so I won't explain how to do so here (it will probably just require you to copy the `fancythm` folder to some directory, and then tell your latex  $\text{\LaTeX}$  distribution that you added a new folder to its directories).

To install the module *Fancy Theorems*, move the file `fancythm.module` to the layouts folder in LyX's user directory (which can be found in **Help**▷**About Lyx.**). After that reconfigure LyX via **Tools**▷**Reconfigure**, and restart LyX.

! Note that the  $\text{\LaTeX}$  package `fancythm` requires the packages `amsthm`, `thmtools` and `multicols`. If the `templates` option is used, `fancythm` loads `xcolor`, `tikz` with the `decorations.pathmorphing` and `shadows` libraries, `varwidth`, and `tcolorbox` with the `most` option. It is recommended to check that all of these packages are installed.

## 1.2. Loading The Module

At first load the module *Fancy Theorems* in the document settings of your file, via **Documents**▷**Settings**▷**Modules**.

If you want to use the `templates` option, write “templates” in the document class options in the document settings of your file.

# 2. Basics

## 2.1. Designing Theorems

Suppose you would like to state the Pythagorean theorem in your document. To do so, go to LyX's environment selection combobox, select the Theorem layout and write the theorem's content (if you would to write an optional note, go to **Insert**▷**Optional Note**, or press **Alt+A 1**).

**Theorem 2.1** (Pythagoras). *In any right triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle).*

To change the appearance of the theorems in the output PDF file insert the **Set Keys** layout via **Insert**▷**Custom Insets**▷**Set Keys**, in the argument inset (called `envs`) write a comma separated list of all the environments names that you want to change (for a list of all the environments names see [subsection 3.2](#)), and in the inset itself write the keys with the appropriate values. For example, we will change the note braces to be square brackets, we will add a symbol to mark the end of the theorem and add more vertical space before the theorem.

Now we should be able to see the changes in all the following theorems (with environment name `thm`).

**Theorem 2.2** [Pythagoras]. *In any right triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle).* ★

! The latex command of that layout is `\setfancymkeys{<envs>}{<key=val>}`, where `<envs>` is a comma separated list of all the environments names that you want to change, and `<key=val>` is a comma separated list of the keys you want to change. In addition, `<envs>` accepts the keywords **all**, **reg**, and **strd** to apply the changes to all environments, all the unstarred variants, or all the starred variants.

The following diagram<sup>1</sup> demonstrates some of the possible theorems keys.

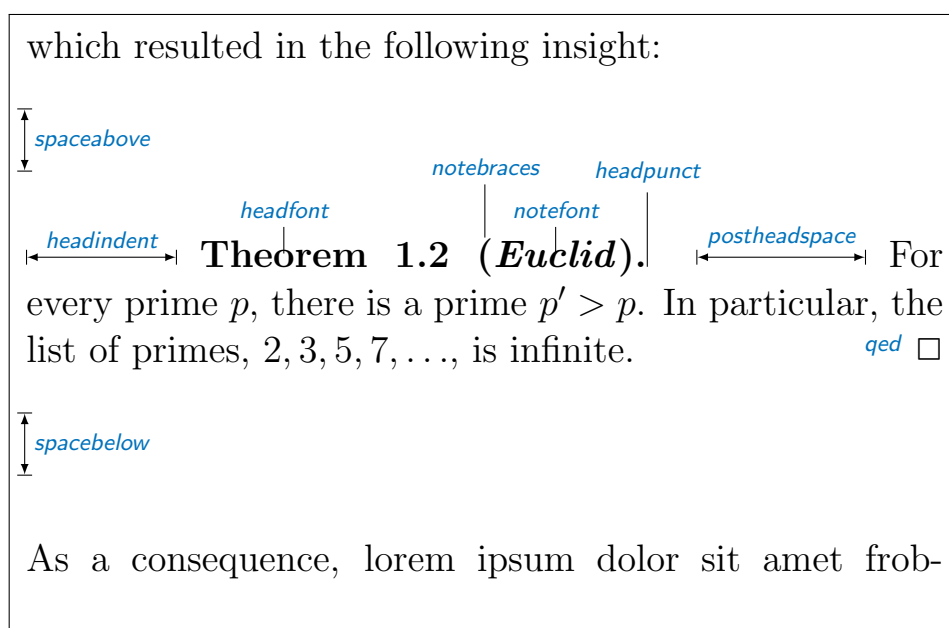


Figure: Settable parameters of a theorem style.

For a full list of keys and their description, see [subsection 3.1](#).

There is an option to use preview box (via **Insert**▷**Preview**) with the theorems layouts, but, to see the changes that you applied you need to include the **Set Keys** layout in the preview box, or, set the keys in the preamble (and make sure that **Tools**▷**Preference**▷**Look & Feel**▷**Display**▷**Instant Preview** is on).

! For example, this paragraph is written with the **Remark\*** layout (its keys are set in the preamble) inside a preview box.

## 2.2. The templates Option

Using the **templates** option gives you access to predefined styles for theorems. To use them, insert the **Set Keys** layout, as before, and in the keys list write a name of one of the styles. For example, here is a theorem with the **fancycolorcoded** style (for a full list of styles see [subsection 3.4](#))

<sup>1</sup>Credit to thmtools

**Theorem 2.3** (Pythagoras). *In any right triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle).*

## 2.3. List of Theorems

To print a list of theorems go to LyX's environment selection combobox, select the List of Theorems layout, and set the keys in the keys inset. Here are two short examples:

### List of Theorems

2.1. Theorem (Pythagoras)	2
2.2. Theorem (Pythagoras)	3
2.3. Theorem (Pythagoras)	4

Now I will change the list format with the swapnumber key, and change the title with the title key

### My Title

Theorem 2.1 (Pythagoras)	2
Theorem 2.2 (Pythagoras)	3
Theorem 2.3 (Pythagoras)	4

For a full list of keys and their description, see [subsection 3.3](#).

## 3. Detailed Information

In the following section, if a key description is titled in violet color, it is similar to a key from `thmtools`, if it is green, it's a new key defined in `fancythm`.

### 3.1. Theorems Keys

- headfont**    **Value: `TEX` code.** Executed just before the head of the theorem is typeset, inside a group. Intended use it to put font switches here.
- notefont**    **Value: `TEX` code.** Executed just before the note in the head is typeset, inside a group. Intended use it to put font switches here. Formatting also applies to the braces around the note.
- bodyfont**    **Value: `TEX` code.** Executed before the begin part of the theorem ends, but before all afterheadhooks. Intended use it to put font switches here.

**headpunct**    **Value:** **T<sub>E</sub>X** code, usually a single character. Put at the end of the theorem’s head, prior to linebreaks or indents.

**headformat**    **Value:** **L<sup>A</sup>T<sub>E</sub>X** code, using the special placeholders `\NUMBER`, `\NAME` and `\NOTE`, which correspond to the (formatted, including the braces for `\NOTE` etc.) three parts of a theorem’s head. This can be used to override the usual style “1.1 Theorem (Foo)”, for example to let the numbers protrude in the margin or put them after the name.



The **headformat** key does not accept the keywords **margin** and **swapnumber** as it would with **thmtools**

**postheadspace**    **Value:** **a length or a glue (with units).** Horizontal space inserted after the entire head of the theorem, before the body. Does probably not apply (or make sense) for styles that have a line-break after the head.

**headindent**    **Value:** **a length or a glue (with units).** Horizontal space inserted before the head. Some publishers like `\parindent` here for remarks, for example.

**title**    **Value:** **T<sub>E</sub>X** code. The title of the theorem.

**name**    Same as **title**

**heading**    same as **title**

**preheadhook**    **Value:** **L<sup>A</sup>T<sub>E</sub>X** code. This code will be executed at the beginning of the environment, even before vertical spacing is added and the head is typeset. However, it is already within the group defined by the environment.

**postheadhook**    **Value:** **L<sup>A</sup>T<sub>E</sub>X** code. This code will be executed after the call to the original `begin-theorem` code. Note that all backends seem to delay typesetting the actual head, so code here should probably enter horizontal mode to be sure it is after the head, but this will change the spacing/wrapping behaviour if your body starts with another list.

**prefoothook**    **Value:** **L<sup>A</sup>T<sub>E</sub>X** code. This code will be executed at the end of the body of the environment.

**postfoothook**    **Value:** **L<sup>A</sup>T<sub>E</sub>X** code. This code will be executed at the end of the environment, even after eventual vertical spacing, but still within the group defined by the environment.

<b>refname</b>	<b>Value: one string, or two strings separated by a comma (no spaces).</b> This is the name of the theorem as used by <code>\autoref</code> , <code>\cref</code> and friends. If it is two strings, the second is the plural form used by <code>\cref</code> . Default value is the value of <b>name</b> .
<b>leftnotebrace</b>	<b>Value: one character,</b> the opening symbol to use around a theorem's note.
<b>rightnotebrace</b>	<b>Value: one character,</b> the closing symbol to use around a theorem's note.
<b>spaceabove</b>	<b>Value: a length or a glue (with units).</b> Vertical space above the theorem, possibly discarded if the theorem is at the top of the page.
<b>spacebelow</b>	<b>Value: a length or a glue (with units).</b> Vertical space after the theorem, possibly discarded if the theorem is at the top of the page.
<b>qed</b>	<b>Value: one character,</b> the closing mark of the theorem (as with proof and <code>\qedsymbol</code> ).
<b>parent</b>	<b>Value: a counter name.</b> The theorem will be reset whenever that counter is incremented. Usually, this will be a sectioning level, <b>chapter</b> or <b>section</b> . If the input is not a counter name, the theorem will become independent.
<b>numberwithin</b>	Same as <b>parent</b> .
<b>within</b>	Same as <b>parent</b> .
<b>numbered</b>	<b>Value: one of the keywords yes or no.</b> The theorem will be numbered, or not numbered.
<b>sibling</b>	<b>Value: a counter name.</b> The theorem will use this counter for numbering. Usually, this is the name of another theorem environment. If the input is not a counter name, the theorem will become independent.
<b>numberlike</b>	Same as <b>sibling</b> .
<b>sharenumber</b>	Same as <b>sibling</b> .



The following keys are not supported: `style`, `Refname`, `shaded`, `thmbox`, `,notebraces` (replaced with `leftnotebrace` and `rightnotebrace`), `mdframed`.

### 3.2. Layouts Information

Environment Name	Layout Name	Default title	Default headfont	Default bodyfont
thm	Theorem	Theorem	\bfseries	\itshape
thm*	Theorem*	Theorem	\bfseries	\itshape
cor	Corollary	Corollary	\bfseries	\itshape
cor*	Corollary*	Corollary	\bfseries	\itshape
lem	Lemma	Lemma	\bfseries	\itshape
lem*	Lemma*	Lemma	\bfseries	\itshape
prop	Proposition	Proposition	\bfseries	\itshape
prop*	Proposition*	Proposition	\bfseries	\itshape
conjecture	Conjecture	Conjecture	\bfseries	\itshape
conjecture*	Conjecture*	Conjecture	\bfseries	\itshape
fact	Fact	Fact	\bfseries	\itshape
fact*	Fact*	Fact	\bfseries	\itshape
defn	Definition	Definition	\bfseries	\mdseries
defn*	Definition*	Definition	\bfseries	\mdseries
example	Example	Example	\bfseries	\mdseries
example*	Example*	Example	\bfseries	\mdseries
problem	Problem	Problem	\bfseries	\mdseries
problem*	Problem*	Problem	\bfseries	\mdseries
xca	Exercise	Exercise	\bfseries	\mdseries
xca*	Exercise*	Exercise	\bfseries	\mdseries
sol	Solution	Solution	\bfseries	\mdseries
sol*	Solution*	Solution	\bfseries	\mdseries
rem	Remark	Remark	\itshape	<empty>
rem*	Remark*	Remark	\itshape	<empty>
claim	Claim	Claim	\itshape	<empty>
claim*	Claim*	Claim	\itshape	<empty>

Table: Names and default fonts of the environments

headpunct={.}	postheadspace=1em	headindent=0pt
preheadhook=<empty>	postheadhook=<empty>	prefoothook=<empty>
postfoothook=<empty>	rightnotebrace=)	leftnotebrace=(
spaceabove=6pt	spacebelow=6pt	numberwithin=section
sibling=<empty>	qed=<empty>	notefont=<empty>
refname=theorems title    numbered=true/false (unstarred/starred)    headformat=\NAME\ \NUMBER\NOTE/ \NAME\NOTE (unstarred/starred)		

Table: Default keys values

### 3.3. List of Theorems Keys

<b>title</b>	<b>Value: title of \listoftheorems.</b> The default is stored in the macro <code>\listtheoremname</code> and is initially “List of Theorems”.
<b>ignore</b>	<b>Value: comma seperated list of theorem environment names.</b> Filter out things by environment names. Default value is list of all defined theorem environments.
<b>ignoreall</b>	Ignore every theorem environment. This key is usually followed by keys <code>show</code> and <code>onlynamed</code> .
<b>show</b>	<b>Value: comma seperated list of theorem environment names.</b> Leave theorems that belong to specified list and filter out others. Default value is list of all defined theorem environments.
<b>showall</b>	The opposite effect of <code>ignoreall</code> .
<b>onlynamed</b>	<b>Value: comma seperated list of theorem environment names.</b> Leave things that are given an optional argument and belong to specified list, and filter out others. Default value is list of all defined theorem environments.
<b>swapnumber</b>	<b>Value: true or false.</b> If set to true, numbers will appear after the theorem name in the list. Initially false and default value is true.
<b>numwidth</b>	<b>Value: a length or a glue (with units).</b> If <code>swapnumber=false</code> , the theorem number is typeset in a box of width <code>numwidth</code> . Initially 1.5pc for AMS classes and 2.3em for others.
<b>columns</b>	<b>Value: a positive integer.</b> If set to an integer bigger than 1, the list of theorems will be printed in a multicol environment with number of columns as the input.



**notitle** Value: **true or false**. Is set to true, the list of theorems will print with no title. Initially false.

### 3.4. Keys - templates option

The following is the full list of styles defined with the **templates** option:

default, named, colorcoded, fancycolorcoded, thmbox, margins, tcb, tcbribbon, tcbdiamond, and bclogo.

! Actually, the keys default, named, and margins are defined in the basic module (without the **templates** option).

To use each of these styles, write it's name in the key list in the **Set Keys** layout. Non of these keys accept value, except margins which accepts a length which represent the distance from the title to the body of the theorem, and thmbox which can get three values: S, M, L (for small, medium and large).

To see all the styles of all the layouts see the file **test\_fancythm.pdf**.

In addition to all the style keys, the **template** option adds three additional keys:

**color** Value: **name of a defined color color, or a mix of several, using xcolor syntax**. It will define the color of all the styles related to the theorem.

**beginstyle** Value: **L<sup>A</sup>T<sub>E</sub>X code**. This code will be executed at the beginning of the environment, but after vertical spacing is added and the head is typeset.

**endstyle** Value: **L<sup>A</sup>T<sub>E</sub>X code**. This code will be executed at the end of the environment, but before eventual vertical spacing.

## 4. Support for Bilingual And RTL Documents

### 4.1. RTL Documents

As this module uses **amsthm**, it is recommended to compile RTL files that includes the Fancy Theorem module with XeLaTeX and polyglossia, as there are known issues with babel and amsthm. Also, all the non-symmetric styles defined in the **templates** option will not display correctly, unless the  **bidi** package is used.

### 4.2. Bilingual Documents

the module will support different fonts for different languages in the theorems environments by default if you use polyglossia, otherwise there would be a need to specify it manually with the relevant font keys.

## A. Documentation of fancythm

this section is incomplete and will be uploaded soon.

### A.1. Initialization

```
1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{fancythm}[2022/10/13]
3
4 \RequirePackage{amsthm}
5 \RequirePackage{thmtools}
```

### A.2. Keys

```
6 \RequirePackage{keyval}
7
8 \def\define@fancythm@key#1#2{%
9     \define@key{fancythm@#1}{#2}{%
10         \@xa\gdef\csname fancythm@#1@#2\endcsname{##1}%
11     }%
12 }
13
14 \def\define@fancythm@title#1{%
15     \@for\env:={title,name,heading}\do{%
16         \@expandtwoargs\define@key{fancythm@#1}{\env}{%
17             \@xa\gdef\csname fancythm@#1@title\endcsname{##1}%
18         }%
19     }%
20 }
21
22 \def\define@fancythm@numbered#1{%
23     \define@key{fancythm@#1}{numbered}[true]{%
24         \def\fancythm@bool{##1}%
25         \ifx\fancythm@bool\thmt@TRUE
26             \@xa\gdef\csname the#1\endcsname{\@arabic{\csname c@#1
27                 \endcsname}}%
28             \global\@namedef{fancythm@#1@space}{\space}%
29         \else
30             \ifx\fancythm@bool\thmt@FALSE
31                 \@xa\gdef\csname the#1\endcsname{}%
32                 \@xa\gdef\csname #1space\endcsname{}%
33             \else
34                 \PackageError{fancythm}{Unknown value '##1' to key
35                     numbered}{}%
36             \fi
37         \fi
38     }%
39 }
40
41 \def\fancythm@counters#1#2{%
```

```

40 \ifcsname c@#2\endcsname
41 \begingroup
42 \def\@elt##1{\counterwithout{#1}{##1}}%
43 \cl@@ckpt
44 \counterwithin{#1}{#2}%
45 \endgroup
46 \setcounter{#1}{0}%
47 \else
48 \begingroup
49 \def\@elt##1{\counterwithout{#1}{##1}}%
50 \cl@@ckpt
51 \endgroup
52 \setcounter{#1}{0}%
53 \fi
54 }
55
56 \def\define@fancythm@numberwithin#1{%
57 \@for\env:={numberwithin,within,parent}\do{%
58 \@expandtwoargs\define@key{fancythm@#1}{\env}[]{%
59 \fancythm@counters{#1}{##1}%
60 }%
61 }%
62 }
63
64 \def\define@fancythm@sibling#1{%
65 \@for\env:={sibling,numberlike,sharenumber}\do{%
66 \@expandtwoargs\define@key{fancythm@#1}{\env}[]{%
67 \ifundefined{c@fancythm@#1}{%
68 \newcounter{fancythm@#1}%
69 \@xa\global\@xa\let\csname c@fancythm@#1\@xa\endcsname
\csname c@#1\endcsname
70 }{}%
71 \ifcsname c@##1\endcsname
72 \@xa\global\@xa\let\csname c@#1\@xa\endcsname\csname c@
##1\endcsname
73 \else
74 \@xa\global\@xa\let\csname c@#1\@xa\endcsname\csname
c@fancythm@#1\endcsname
75 \setcounter{#1}{0}%
76 \fi
77 }%
78 }%
79 }
80
81 \def\define@fancythm@keyfamily#1{%
82 \define@fancythm@key{#1}{headfont}%
83 \define@fancythm@key{#1}{notefont}%
84 \define@fancythm@key{#1}{bodyfont}%
85 \define@fancythm@key{#1}{headpunct}%
86 \define@fancythm@key{#1}{headformat}%

```

```

87 \define@fancythm@key{#1}{postheadspace}%
88 \define@fancythm@key{#1}{headindent}%
89 \define@fancythm@title{#1}%
90 \define@fancythm@key{#1}{preheadhook}%
91 \define@fancythm@key{#1}{postheadhook}%
92 \define@fancythm@key{#1}{prefoothook}%
93 \define@fancythm@key{#1}{postfoothook}%
94 \define@fancythm@key{#1}{refname}%
95 \define@fancythm@key{#1}{leftnotebrace}%
96 \define@fancythm@key{#1}{rightnotebrace}%
97 \define@fancythm@key{#1}{spaceabove}%
98 \define@fancythm@key{#1}{spacebelow}%
99 \define@fancythm@key{#1}{qed}%
100 \define@fancythm@numberwithin{#1}%
101 \define@fancythm@numbered{#1}%
102 \define@fancythm@sibling{#1}%
103 }
104
105 \def\setfancythmkeys#1#2{%
106 \def\fancythm@templst{#1}%
107 \@expandtwoargs\in@{,all,}{, \fancythm@templst,} \ifin@
108 \ifx \fancythm@envs \@gobble \else
109 \@for \fam:=\fancythm@envs \do{%
110 \setkeys{fancythm@\fam}{#2}%
111 }%
112 \fi
113 \@expandtwoargs\@removeelement{all}\fancythm@templst
114 \fancythm@templst
115 \fi
116 \@expandtwoargs\in@{,reg,}{, \fancythm@templst,} \ifin@
117 \ifx \fancythm@regenvs \@gobble \else
118 \@for \fam:=\fancythm@regenvs \do{%
119 \setkeys{fancythm@\fam}{#2}%
120 }%
121 \fi
122 \@expandtwoargs\@removeelement{reg}\fancythm@templst
123 \fancythm@templst
124 \fi
125 \@expandtwoargs\in@{,strd,}{, \fancythm@templst,} \ifin@
126 \ifx \fancythm@strdenvs \@gobble \else
127 \@for \fam:=\fancythm@strdenvs \do{%
128 \setkeys{fancythm@\fam}{#2}%
129 }%
130 \fi
131 \@expandtwoargs\@removeelement{strd}\fancythm@templst
132 \fancythm@templst
133 \fi
134 \ifx \fancythm@templst \@empty \else
135 \@for \fam:=\fancythm@templst \do{%
136 \ifcsname fancythm@#1@title \endcsname

```

```

134         \setkeys{fancythm@\fam}{#2}%
135     \fi
136 }%
137 \fi
138 }

```

### A.3. Defaults

```

139 \def\fancythm@lang@font{}
140
141 \AtBeginDocument{%
142     \@ifundefined{language}{\relax}{%
143         \def\fancythm@lang@font{\csname\language font\endcsname}%
144     }%
145     \@ifpackageloaded{hyperref}{%
146         \newcounter{@fancythm@hyperref}% a dummy counter for correct
147         hyper-links
148         \addtotheorempreheadhook{\stepcounter{@fancythm@hyperref}}%
149     }{}%
150
151 \def\define@fancythm@defaults#1#2{%
152     \define@key{fancythm@#1}{default}{\relax}{%
153         \setkeys{fancythm@#1}{%
154             headformat=\csname #1title\endcsname\NUMBER\NOTE,
155             notefont=\normalfont\fancythm@lang@font,
156             headpunct={.},
157             postheadspace=1em,
158             headindent=0pt,
159             preheadhook=,
160             postheadhook=,
161             prefoothook=,
162             postfoothook=,
163             rightnotebrace=),
164             leftnotebrace=(,
165             spaceabove=6pt,
166             spacebelow=6pt,
167             qed=,
168             #2
169         }%
170         \@xa\gdef\csname fancythm@#1@beginstyle\endcsname{}
171         \@xa\gdef\csname fancythm@#1@endstyle\endcsname{}
172     }%
173     \define@key{fancythm@#1}{named}{\relax}{%
174         \setkeys{fancythm@#1}{%
175             default,
176             headformat={\def\thmt@space{}\NOTE},
177             notefont=\bfseries,
178             bodyfont=\itshape,
179             rightnotebrace=,
180             leftnotebrace=,

```

```

181         numbered=false
182     }%
183 }%
184 \define@key{fancythm@#1}{margins}[1.3in]{%
185     \setkeys{fancythm@#1}{%
186         default ,
187         headformat={\def\thmt@space{} \llap{\smash{\parbox[t]{##1}{
188             \centering \csname #1title\endcsname \ \NUMBER}}}\NOTE},
189         headfont=\bfseries ,
190         notefont=\bfseries ,
191         bodyfont=\upshape ,
192         headpunct=,
193         postheadspace=0pt ,
194         rightnotebrace=. \hspace{1em} ,
195         leftnotebrace=,
196     }%
197 }

```

#### A.4. Theorems Deceleration

```

198 % three macros that holds the list of theorems ,
199 % unstarred theorems and starred theorems
200 % defined with \declarefancythm
201 \let \fancythm@envs \@gobble
202 \let \fancythm@regenvs \@gobble
203 \let \fancythm@strdenvs \@gobble
204
205 \newcommand{\declarefancythm}[5]{% #1 = env name, #2 = default keys, #3
    = default title, #4 = color, #5 = logo
206     \define@fancythm@keyfamily{#1}%
207     \global\@namedef{#1title}{\@nameuse{fancythm@#1@title}\@nameuse{
        fancythm@#1@space}}%
208     \setkeys{fancythm@#1}{title=#3}%
209     \setkeys{fancythm@#1}{refname=\csname fancythm@#1@title\endcsname}%
210     \AtBeginDocument{%
211         \@ifpackageloaded{hyperref}{%
212             \@xa\global\@xa\let\csname theH#1\endcsname
                \the@fancythm@hyperref
213         }{}%
214     }%
215     \define@fancythm@defaults{#1}{#2}%
216     \setkeys{fancythm@#1}{default}%
217     \declaretheoremstyle[%
218         headfont=\normalfont\fancythm@lang@font\csname fancythm@#1
            @headfont\endcsname ,
219         notefont=\normalfont\fancythm@lang@font\csname fancythm@#1
            @notefont\endcsname ,
220         bodyfont=\normalfont\fancythm@lang@font\csname fancythm@#1
            @bodyfont\endcsname ,
221         headpunct={\csname fancythm@#1@headpunct\endcsname} ,

```

```

222     headformat={\hspace*{\csname fancythm@#1@headindent\endcsname}
223         \csname fancythm@#1@headformat\endcsname},
224     notebraces={\csname fancythm@#1@leftnotebrace\endcsname}{\csname
225         fancythm@#1@rightnotebrace\endcsname},
226     postheadspace=\csname fancythm@#1@postheadspace\endcsname,
227     spaceabove=0pt,
228     spacebelow=0pt}{fancythm@#1}%
229 \declaretheorem[%
230     style=fancythm@#1,
231     title=\protect\csname fancythm@#1@title\endcsname,
232     preheadhook=\csname fancythm@#1@preheadhook\endcsname\vspace{
233         \csname fancythm@#1@spaceabove\endcsname}\csname fancythm@#1
234         @beginstyle\endcsname,
235     postheadhook=\csname fancythm@#1@postheadhook\endcsname,
236     prefoothook=\csname fancythm@#1@prefoothook\endcsname,
237     postfoothook=\csname fancythm@#1@endstyle\endcsname\vspace{
238         \csname fancythm@#1@spacebelow\endcsname}\csname fancythm@#1
239         @postfoothook\endcsname,
240     refname=\csname fancythm@#1@refname\endcsname,
241     qed=\csname fancythm@#1@qed\endcsname}{#1}%
242 \edef\fancythm@envs{\fancythm@envs,#1}%
243 \in@{*@fancythm@strd}{#1@fancythm@strd}\ifin@
244     \setkeys{fancythm@#1}{numberwithin=section,numbered=false}%
245     \edef\fancythm@strdenvs{\fancythm@strdenvs,#1}%
246 \else
247     \setkeys{fancythm@#1}{numbered=true,numberwithin=section}%
248     \edef\fancythm@regenvs{\fancythm@regenvs,#1}%
249 \fi
250 \if@fancythm@templates@
251     \colorlet{fancythm@#1@color}{#4}%
252     \@xa\def\csname fancythm@#1@logo\endcsname{\includegraphics[width
253         =17pt]{#5}}%
254     \define@fancythm@style{#1}%
255 \fi
256 }
257 \@onlypreamble\declarefancythm

```

## A.5. List of Theorems

```

252 % new keys that supports a list with no title, and a list inside multicol
253 \RequirePackage{multicol}
254 \define@key{thmt-listof}{columns}[1]{\def\fancythm@listofthm@columns{#1}}
255
256 \newif\if@fancythm@notitle@
257 \define@key{thmt-listof}{notitle}[true]{%
258     \def\fancythm@bool{#1}%
259     \ifx\fancythm@bool\thmt@TRUE
260         \@fancythm@notitle@true
261     \else
262         \ifx\fancythm@bool\thmt@FALSE

```

```

263         \@fancythm@notitle@false
264     \else
265         \PackageError{fancythm}{Unknown value '#1' to key notitle}{}%
266     \fi
267 \fi
268 }
269
270 \def\fancythm@listofthm@columns{1}
271 % the new \thmt@mklistcmd check if
272 % a theorem was defined via \declarefancythm.
273 % if it is, the entry lable will be \fancythm@<envname>@title ,
274 % if not, it will execute the original definition
275 \renewcommand{\thmt@mklistcmd}{%
276     \ifcsname fancythm@\csname thmt@envname\endcsname @title\endcsname
277     \thmtlo@newentry
278     \ifthmt@isstarred
279         \@xa\def\csname ll@\thmt@envname\endcsname{%
280             \protect\ifthmt@listswap
281             \protect\else
282             \protect\numberline{\protect\let\protect\autodot\protect
283                 \@empty}%
284             \protect\fi
285             \csname fancythm@\csname thmt@envname\endcsname @title
286                 \endcsname
287             \ifx\@empty\thmt@shortoptarg\else\protect
288                 \thmtformatoptarg{\thmt@shortoptarg}\fi
289         }%
290     \else
291         \@xa\def\csname ll@\thmt@envname\endcsname{%
292             \protect\ifthmt@listswap
293             \csname fancythm@\csname thmt@envname\endcsname @title
294                 \endcsname~\csname the\thmt@envname\endcsname
295             \protect\else
296             \protect\numberline{\csname the\thmt@envname\endcsname}%
297             \csname fancythm@\csname thmt@envname\endcsname @title
298                 \endcsname
299             \protect\fi
300             \ifx\@empty\thmt@shortoptarg\else\protect
301                 \thmtformatoptarg{\thmt@shortoptarg}\fi
302         }%
303     \fi
304     \@xa\gdef\csname thmt@contentsline@\thmt@envname\endcsname{%
305         \thmt@contentslineShow
306     }%
307 \else
308     \thmtlo@newentry
309     \ifthmt@isstarred
310         \@xa\def\csname ll@\thmt@envname\endcsname{%
311             \protect\ifthmt@listswap
312             \protect\else

```



```

307         \protect\numberline{\protect\let\protect\autodot\protect
           \@empty}%
308     \protect\fi
309     \thmt@thmname
310     \ifx\@empty\thmt@shortoptarg\else\protect
           \thmtformatoptarg{\thmt@shortoptarg}\fi
311 }%
312 \else
313     \@xa\def\csname ll@\thmt@envname\endcsname{%
314         \protect\ifthmt@listswap
315         \thmt@thmname~\csname the\thmt@envname\endcsname
316         \protect\else
317         \protect\numberline{\csname the\thmt@envname\endcsname}%
318         \thmt@thmname
319         \protect\fi
320         \ifx\@empty\thmt@shortoptarg\else\protect
           \thmtformatoptarg{\thmt@shortoptarg}\fi
321     }%
322 \fi
323 \@xa\gdef\csname thmt@contentsline@\thmt@envname\endcsname{%
324     \thmt@contentslineShow
325 }%
326 \fi
327 }

```

## B. Documentation of fancythm-styles

this section is incomplete and will be uploaded soon.

### B.1. Initialization

```

328 \NeedsTeXFormat{LaTeX2e}
329 \ProvidesPackage{fancythm-styles}[2022/10/13]
330
331 \RequirePackage{xcolor}
332 \RequirePackage{tikz}
333 \usetikzlibrary{decorations.pathmorphing,shadows} % forbclogo
334 \RequirePackage{varwidth}
335 \RequirePackage[most]{tcolorbox}

```

### B.2. Tcbset

```

336 \tcbset{%
337     fancythm@right@thmbox/.style={%
338         enhanced ,
339         breakable ,
340         sharp corners=all ,
341         top=0mm,
342         bottom=0mm,
343         left=0mm,

```



```

frame.south east);},
386 overlay last={
387 \draw ([xshift=-3.5mm] frame.north east)|-([xshift=-15mm] frame
.south east);},
388 },
389 fancythm@right@thmboxLQ/.style={fancythm@right@thmbox,
390 overlay unbroken ={
391 \draw (title.south east)--(title.south west);
392 \draw ([xshift=-3.5mm] frame.north east)|-([xshift=-15mm] frame
.south east);
393 \node[anchor=west] at (frame.south west) {$\square$};},
394 overlay first={
395 \draw (title.south east)--(title.south west);
396 \draw ([xshift=-3.5mm] frame.north east)--([xshift=-3.5mm]
frame.south east);},
397 overlay middle={
398 \draw ([xshift=-3.5mm] frame.north east)--([xshift=-3.5mm]
frame.south east);},
399 overlay last={
400 \draw ([xshift=-3.5mm] frame.north east)|-([xshift=-15mm] frame
.south east);
401 \node[anchor=west] at (frame.south west) {$\square$};},
402 },
403 fancythm@left@thmbox/.style={fancythm@right@thmbox,
404 left=4mm, right=0mm,
405 attach boxed title to top left,
406 boxed title style={empty, size=minimal, bottom=1.5mm},
407 overlay unbroken ={
408 \draw (title.south west)--(title.south east);
409 \draw ([xshift=3.5mm] frame.north west)|-%
410 (frame.south east)--(frame.north east);},
411 overlay first={
412 \draw (title.south west)--(title.south east);
413 \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
south west);
414 \draw (frame.north east)--(frame.south east);},
415 overlay middle={
416 \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
south west);
417 \draw (frame.north east)--(frame.south east);},
418 overlay last={
419 \draw ([xshift=3.5mm] frame.north west)|-%
420 (frame.south east)--(frame.north east);},
421 },
422 fancythm@left@thmboxS/.style={fancythm@left@thmbox,
423 overlay unbroken ={
424 \draw (title.south west)--(title.south east);
425 \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
south west);},
426 overlay first={

```

```

427         \draw (title.south west)--(title.south east);
428         \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
429 overlay middle={
430     \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
431 overlay last={
432     \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
433 },
434 fancythm@left@thmboxL/.style={fancythm@left@thmbox,
435 overlay unbroken ={
436     \draw (title.south west)--(title.south east);
437     \draw ([xshift=3.5mm] frame.north west)|-([xshift=15mm] frame.
           south west);},
438 overlay first={
439     \draw (title.south west)--(title.south east);
440     \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
441 overlay middle={
442     \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
443 overlay last={
444     \draw ([xshift=3.5mm] frame.north west)|-([xshift=15mm] frame.
           south west);},
445 },
446 fancythm@left@thmboxLQ/.style={fancythm@left@thmbox,
447 overlay unbroken ={
448     \draw (title.south west)--(title.south east);
449     \draw ([xshift=3.5mm] frame.north west)|-([xshift=15mm] frame.
           south west);
450     \node[anchor=east] at (frame.south east) {$\square$};},
451 overlay first={
452     \draw (title.south west)--(title.south east);
453     \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
454 overlay middle={
455     \draw ([xshift=3.5mm] frame.north west)--([xshift=3.5mm] frame.
           south west);},
456 overlay last={
457     \draw ([xshift=3.5mm] frame.north west)|-([xshift=15mm] frame.
           south west);
458     \node[anchor=east] at (frame.south east) {$\square$};},
459 },
460 fancythm@tcribbon@left/.style={enhanced,breakable,
461 colback=black!5,
462 colframe=black!50,
463 boxrule=0.2mm,
464 attach boxed title to top left={xshift=1cm,yshift*=1mm-
           \tcboxedtitleheight},

```

```

465     varwidth boxed title*=-3cm,
466     boxed title style={frame code={%
467     \path[fill=tcbcolback!30!black]
468     ([yshift=-1mm,xshift=-1mm]frame.north west)
469     arc[start angle=0,end angle=180,radius=1mm]
470     ([yshift=-1mm,xshift=1mm]frame.north east)
471     arc[start angle=180,end angle=0,radius=1mm];
472     \path[left color=tcbcolback!60!black,right color=tcbcolback!60!
         black,
473     middle color=tcbcolback!80!black]
474     ([xshift=-2mm]frame.north west) — ([xshift=2mm]frame.north east)
475     [rounded corners=1mm]— ([xshift=1mm,yshift=-1mm]frame.north east
         )
476     — (frame.south east) — (frame.south west)
477     — ([xshift=-1mm,yshift=-1mm]frame.north west)
478     [sharp corners]— cycle;
479     },
480     interior engine=empty,
481     },
482     extras middle and last pre={top=0mm}
483 },
484 fancythm@tcbribbon@right/.style={fancythm@tcbribbon@left,
485     attach boxed title to top right={xshift=-1cm,yshift*=-1mm-
         \tcbboxedtitleheight},
486     boxed title style={frame code={%
487     \path[fill=tcbcolback!30!black]
488     ([yshift=-1mm,xshift=-1mm]frame.north west)
489     arc[start angle=0,end angle=180,radius=1mm]
490     ([yshift=-1mm,xshift=1mm]frame.north east)
491     arc[start angle=180,end angle=0,radius=1mm];
492     \path[left color=tcbcolback!60!black,right color=tcbcolback!60!
         black,
493     middle color=tcbcolback!80!black]
494     ([xshift=-2mm]frame.north west) — ([xshift=2mm]frame.north east)
495     [rounded corners=1mm]— ([xshift=1mm,yshift=-1mm]frame.north east
         )
496     — (frame.south east) — (frame.south west)
497     — ([xshift=-1mm,yshift=-1mm]frame.north west)
498     [sharp corners]— cycle;
499     },
500     interior engine=empty,
501     },
502 },
503 fancythm@tcb@diamond/.style={%
504     enhanced,breakable,attach boxed title to top center={%
505     yshift=-0.25mm-\tcbboxedtitleheight/2,yshifttext=2mm-
         \tcbboxedtitleheight/2},
506     boxed title style={boxrule=0.5mm,
507     frame code={ \path[tcb fill frame] ([xshift=-4mm]frame.west)
508     — (frame.north west) — (frame.north east) — ([xshift=4mm]frame

```

```

509         . east)
510     — (frame.south east) — (frame.south west) — cycle; },
511     interior code={ \path[tcb fill interior] ([xshift=-2mm]interior.
512         west)
513         — (interior.north west) — (interior.north east)
514         — ([xshift=2mm]interior.east) — (interior.south east) — (
515             interior.south west)
516         — cycle;}}
517 },
518 fancythm@colorcoded@right/.style={%
519     enhanced,breakable,frame hidden,
520     boxrule=0pt,rightrule=3pt,boxsep=0pt,sharp corners,
521     left=0pt,right*=10pt,top=0mm,bottom=0mm,
522 },
523 fancythm@colorcoded@left/.style={%
524     fancythm@colorcoded@right,
525     leftrule=3pt,rightrule=0pt,
526     left*=10pt,right=0pt,
527 },
528 fancythm@bclogo@left/.style={%
529     enhanced,breakable,boxrule=-1pt,boxsep=0pt,arc=2mm,toptitle=3mm,
530     right=1mm,pad at break=2mm,leftrule=1pt,top=3mm,drop fuzzy shadow
531     ,
532     rightrule=1pt,toprule=1pt,left=7mm,bottomrule=1pt
533 },
534 fancythm@bclogo@right/.style={%
535     enhanced,breakable,boxrule=-1pt,boxsep=0pt,arc=2mm,toptitle=3mm,
536     left=1mm,pad at break=2mm,leftrule=1pt,top=3mm,drop fuzzy shadow
537     southwest,
538     rightrule=1pt,toprule=1pt,right=7mm,bottomrule=1pt
539 }
540 }
541 }

```

### B.3. RTL switches

```

536 \def\fancythm@thmbox@side{fancythm@left@thmbox}
537 \def\fancythm@colorcoded@side{fancythm@colorcoded@left}
538 \def\fancythm@tcb@ribbon{fancythm@tcbribbon@left}
539 \def\fancythm@bclogo@side{fancythm@bclogo@left}
540
541 \AtBeginDocument{%
542     \@ifundefined{if@RTL}{%
543         \def\fancythm@colorcoded@RTL{%
544             \if@RTL
545                 \def\fancythm@colorcoded@dir{east}
546                 \def\fancythm@colorcoded@side{fancythm@colorcoded@right}%
547             \else
548                 \def\fancythm@colorcoded@dir{west}
549                 \def\fancythm@colorcoded@side{fancythm@colorcoded@left}%
550             \fi
551         }%

```

```

552 \def\fancythm@thmbox@RTL{%
553     \if@RTL
554         \def\fancythm@thmbox@side{fancythm@right@thmbox}%
555     \else
556         \def\fancythm@thmbox@side{fancythm@left@thmbox}%
557     \fi
558 }%
559 \def\fancythm@tcbribbon@RTL{%
560     \if@RTL
561         \def\fancythm@tcb@ribbon{fancythm@tcbribbon@right}%
562     \else
563         \def\fancythm@tcb@ribbon{fancythm@tcbribbon@left}%
564     \fi
565 }%
566 \def\fancythm@bclogo@RTL{%
567     \if@RTL
568         \def\fancythm@bclogo@side{fancythm@bclogo@right}%
569         \def\fancythm@bclogo@xshift{-4mm}%
570         \def\fancythm@bclogo@dir{east}%
571     \else
572         \def\fancythm@bclogo@side{fancythm@bclogo@left}%
573         \def\fancythm@bclogo@xshift{4mm}%
574         \def\fancythm@bclogo@dir{west}%
575     \fi
576 }%
577 }%
578 }
579
580 \def\fancythm@colorcoded@dir{west}
581 \def\fancythm@bclogo@xshift{4mm}
582 \def\fancythm@bclogo@dir{west}
583 \def\fancythm@colorcoded@RTL{}
584 \def\fancythm@thmbox@RTL{}
585 \def\fancythm@tcbribbon@RTL{}
586 \def\fancythm@bclogo@RTL{}

```

#### B.4. Style Keys

```

587 \def\define@fancythm@style#1{%
588     \define@fancythm@key{#1}{beginstyle}
589     \define@fancythm@key{#1}{endstyle}
590     \define@key{fancythm@#1}{color}{%
591         \colorlet{fancythm@#1@color}{##1}%
592     }%
593     \define@key{fancythm@#1}{colorcoded}{[\relax]{%
594         \setkeys{fancythm@#1}{%
595             default ,
596             beginstyle={%
597                 \fancythm@colorcoded@RTL
598                 \begin{tcolorbox}[
599                     \fancythm@colorcoded@side ,

```

```

600             colback=white ,
601             borderline \fancythm@colorcoded@dir={3pt}{0pt}{
                fancythm@#1@color}
602         ]%
603     },
604     endstyle=\end{tcolorbox}
605 }%
606 }%
607 \define@key{fancythm@#1}{fancycolorcoded}{\relax}{%
608     \setkeys{fancythm@#1}{%
609         default ,
610         beginstyle={%
611             \fancythm@colorcoded@RTL
612             \begin{tcolorbox}[
613                 \fancythm@colorcoded@side ,
614                 borderline \fancythm@colorcoded@dir={3pt}{0pt}{
                    fancythm@#1@color} ,
615                 colback=fancythm@#1@color!7 ,
616                 boxsep=3mm,
617                 bottom=-1mm,
618                 top=-1mm
619             ]%
620         },
621         endstyle=\end{tcolorbox} ,
622     }%
623     \@xa\g@addto@macro\csname fancythm@#1@headfont\endcsname{\color{
        fancythm@#1@color!70!black}}}%
624 }%
625 \define@key{fancythm@#1}{thmbox}[]{%
626     \setkeys{fancythm@#1}{%
627         default ,
628         headformat=\global\let\fancythm@note\NOTE,
629         headpunct=,
630         postheadspace=0em,
631         postheadhook={%
632             \fancythm@thmbox@RTL
633             \begin{tcolorbox}[
634                 \fancythm@thmbox@side##1,
635                 fonttitle=\normalfont\fancythm@lang@font\csname
                    fancythm@#1@headfont\endcsname ,
636                 title=\csname #1title\endcsname\csname the#1
                    \endcsname\fancythm@note\csname fancythm@#1
                    @headpunct\endcsname ,
637                 fontupper=\normalfont\fancythm@lang@font\csname
                    fancythm@#1@bodyfont\endcsname
638             ]%
639         },
640         prefoothook=\end{tcolorbox} ,
641     }%
642 }%

```



```

643 \define@key{fancythm@#1}{tcb}{\relax}{%
644     \setkeys{fancythm@#1}{%
645         thmbox,
646         postheadhook={%
647             \begin{tcolorbox}[%
648                 breakable,enhanced,
649                 colback=fancythm@#1@color!5!white,
650                 colframe=fancythm@#1@color!75!black,
651                 fonttitle=\normalfont\fancythm@lang@font\csname
                     fancythm@#1@headfont\endcsname,
652                 title=\csname #1title\endcsname\csname the#1
                     \endcsname\fancythm@note\csname fancythm@#1
                     @headpunct\endcsname,
653                 fontupper=\normalfont\fancythm@lang@font\csname
                     fancythm@#1@bodyfont\endcsname
654             ]%
655         }
656     }%
657 }%
658 \define@key{fancythm@#1}{tcbribbon}{\relax}{%
659     \setkeys{fancythm@#1}{%
660         thmbox,
661         postheadhook={%
662             \fancythm@tcbribbon@RTL
663             \begin{tcolorbox}[
664                 \fancythm@tcb@ribbon,
665                 colbacktitle=fancythm@#1@color,
666                 fonttitle=\normalfont\fancythm@lang@font\csname
                     fancythm@#1@headfont\endcsname,
667                 title=\csname #1title\endcsname\csname the#1
                     \endcsname\fancythm@note\csname fancythm@#1
                     @headpunct\endcsname,
668                 fontupper=\normalfont\fancythm@lang@font\csname
                     fancythm@#1@bodyfont\endcsname,
669                 colback=fancythm@#1@color!10!white
670             ]%
671         }
672     }%
673 }%
674 \define@key{fancythm@#1}{tcbdiamond}{\relax}{%
675     \setkeys{fancythm@#1}{%
676         thmbox,
677         postheadhook={%
678             \begin{tcolorbox}[
679                 fancythm@tcb@diamond,
680                 colframe=fancythm@#1@color!50!black,
681                 colback=fancythm@#1@color!10!white,
682                 colbacktitle=fancythm@#1@color!5!yellow!10!white,
683                 coltitle=black,
684                 fonttitle=\normalfont\fancythm@lang@font\csname

```

```

685         fancythm@#1@headfont\endcsname ,
        title=\csname #1title\endcsname\csname the#1
            \endcsname\fancythm@note\csname fancythm@#1
            @headpunct\endcsname ,
686         fontupper=\normalfont\fancythm@lang@font\csname
            fancythm@#1@bodyfont\endcsname
687     ]%
688     }
689 }%
690 }%
691 \define@key{fancythm@#1}{bclogo}{\relax}{%
692     \setkeys{fancythm@#1}{%
693         thmbox,
694         postheadhook={%
695             \fancythm@bclogo@RTL
696             \begin{tcolorbox}%
697                 \fancythm@bclogo@side ,
698                 colframe=fancythm@#1@color!50!white ,
699                 colback=fancythm@#1@color!10!white ,
700                 colbacktitle=fancythm@#1@color!10!white ,
701                 coltitle=black ,
702                 fonttitle=\normalfont\fancythm@lang@font\large\csname
                    fancythm@#1@headfont\endcsname ,
703                 title=\csname #1title\endcsname\csname the#1
                    \endcsname\fancythm@note\csname fancythm@#1
                    @headpunct\endcsname ,
704                 fontupper=\normalfont\fancythm@lang@font\csname
                    fancythm@#1@bodyfont\endcsname ,
705                 overlay unbroken and first={\node[inner sep=0pt] (
                    logo) at ([xshift=\fancythm@bclogo@xshift,yshift
                    =-5mm]frame.north \fancythm@bclogo@dir) {\csname
                    fancythm@#1@logo\endcsname};
706                 \draw[black,line width=2pt,decorate=true,decoration=
                    snake] (logo) — ([xshift=\fancythm@bclogo@xshift,
                    yshift=1.5mm]frame.south \fancythm@bclogo@dir);} ,
707                 overlay middle and last={\draw[black,line width=2pt,
                    decorate=true,decoration=snake] ([xshift=
                    \fancythm@bclogo@xshift,yshift=-1.5mm]frame.north
                    \fancythm@bclogo@dir) — ([xshift=
                    \fancythm@bclogo@xshift,yshift=1.5mm]frame.south
                    \fancythm@bclogo@dir);}
708             ]%
709         }
710     }%
711 }%
712 }
713 \endinput

```