

# keytheorems package

version 0.0.6 $\gamma$

[github.com/mbertucci47/keytheorems](https://github.com/mbertucci47/keytheorems)

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## Abstract

An expl3-implementation of a key-value interface to `amsthm`, implementing most of the functionality provided by `thmtools`. Very much not a finished product. Don't use it for anything important!

## 1 Dependencies

Without using the `tcolorbox`<sup>→P.6</sup> or `tcolorbox-no-titlebar`<sup>→P.6</sup> options, the package loads the `aliascnt`, `amsthm`, `refcount`, and `translations` packages.

## 2 Load-time Options

`overload` (initially unset)

Redefines `\newtheorem` to internally use the `keytheorems` machinery. The syntax remains the same.

`thmtools-compat` (initially unset)

For compatibility with `thmtools` syntax. Currently defines the following commands:

thmtools command	keytheorems replacement
<code>\declaretheorem</code>	<code>\newkeytheorem</code> <sup>→P.2</sup>
<code>\declaretheoremstyle</code>	<code>\newkeytheoremstyle</code> <sup>→P.6</sup>
<code>\listoftheorems</code>	<code>\listofkeytheorems</code> <sup>→P.8</sup>
<code>\addtotheoremheadhook</code>	
<code>\addtotheoremheadhook</code>	
<code>\addtotheoremheadhook</code>	<code>\addtotheoremhook</code> <sup>→P.10</sup>
<code>\addtotheoremheadhook</code>	
<code>\addtotheoremheadhook</code>	
<code>restatable</code> environment	<code>store</code> <sup>→P.3</sup> key

Also defined are the `shaded` and `thmbox` keys, implemented internally with `tcolorbox` rather than the `shadethm` and `thmbox` packages, respectively.

`store-all` (initially unset)

Tells `keytheorems` to grab the body of each theorem so it can later be printed with the `print-body`<sup>→P.9</sup> option of `\listofkeytheorems`<sup>→P.8</sup>. Note that this means a theorem body *cannot* contain verbatim material.

## 3 Global Options

`\keytheoremset{<options>}`

`restate-counters={<comma-list of counters>}` (initially `{equation}`)

Additional counters whose values are preserved when a theorem is restated. This key does not reset the list, so you don't need to include `equation` in `<comma-list>`.

`continues-code`= $\langle code with \#1 \rangle$  (initially `\GetTranslation{keythms_continues}\pageref{\#1}`)

The code used to typeset the note produced by the `continues`<sup>P.3</sup> key. If English is used or an unknown language is used, defaults to continuing from `p.\,\,\pageref{\#1}`. Currently (bad!) translations exist for French, German, and Spanish.

`qed-symbol`= $\langle symbol \rangle$  (initially `\openbox`)

Redefines `\qedsymbol` to be  $\langle symbol \rangle$ .

## 4 Defining Theorems

`\newkeytheorem`{ $\langle env name \rangle$ }[ $\langle options \rangle$ ]

Defines a theorem environment  $\langle env name \rangle$  which itself takes a few options (see subsection 4.1). You can also declare multiple theorems at once by replacing  $\langle env name \rangle$  with a comma-list of names, e.g. `\newkeytheorem{theorem,lemma,proposition}[ $\langle options \rangle$ ]`.

By default, the theorem's printed name is a title-cased  $\langle env name \rangle$ . This can be changed with the `name`<sup>P.4</sup> key. All  $\langle options \rangle$  are described in subsections 4.2 and 4.3.

```
% preamble
\newkeytheorem{theorem}

% document
\begin{theorem}
Some text
\end{theorem}
```

**Theorem 1.** *Some text*

### 4.1 Keys available to theorem environments

As in `amsthm`, theorems can take an optional argument that contains a note or heading.

```
\begin{theorem}[some heading]
Some text
\end{theorem}
```

**Theorem 2** (some heading). *Some text*

Alternatively, the optional argument may contain any of the following keys.

`note`= $\langle text \rangle$  (initially unset)

Alias `name`. This is the key-value equivalent of the optional argument described above. This syntax, however, allows the argument to contain other keys.

```
\begin{theorem}[some heading]
Some text
\end{theorem}
\begin{theorem}[note=another heading]
Some more text
\end{theorem}
```

**Theorem 3** (some heading). *Some text*

**Theorem 4** (another heading). *Some more text*

`short-note`= $\langle text \rangle$  (initially unset)

Alias `short-name`. This replaces the value of `note` when displayed in `\listofkeytheorems`<sup>P.8</sup>.

`label`= $\langle label name \rangle$  (initially unset)

This is the key-value equivalent of `\begin{theorem} \label{\langle label name \rangle}`.

```
\begin{theorem}[label=foo]
Some text
\end{theorem}
\ref{foo}
```

**Theorem 5.** *Some text*

5

`continues*=<label name>` (initially unset)

Pick up a theorem where you left off. The theorem number remains the same. The printed text can be customized with the `continues-code` option. The starred version also copies the theorem note, if it exists.

```
\begin{theorem}[continues=foo]
\dots and some more text.
\end{theorem}
```

**Theorem 5** (continuing from p. 2). ... *and some more text.*

`store=<tag>` (initially unset)

Alias `restate`. Stores the the theorem to be restated at any point in the document with `\getkeytheorem`<sup>P. 7</sup>.

```
\begin{theorem}[store=blub]
A theorem worth restating.
\end{theorem}
More brilliant mathematics.
\getkeytheorem{blub}
```

**Theorem 6.** *A theorem worth restating.*  
More brilliant mathematics.  
**Theorem 6.** *A theorem worth restating.*

A theorem given this key *cannot* contain verbatim material or other unexpected catcodes, such as a `tikz-cd` diagram. The latter issue can be averted with the `ampersand-replacement` key.

```
% preamble
\usepackage{tikz}
\usetikzlibrary{cd}

% document
\begin{lemma}[store=diagram]
Some commutative diagram:
\[\begin{tikzcd}[ampersand
  \rightarrow replacement=\&]
X\times_S Y \ar[r] \ar[d] \& X \ar[d] \\
Y \ar[r] \& S
\end{tikzcd}\]
\end{lemma}
\dots
\getkeytheorem{diagram}
```

**Lemma 7.** *Some commutative diagram:*

$$\begin{array}{ccc} X \times_S Y & \longrightarrow & X \\ \downarrow & & \downarrow \\ Y & \longrightarrow & S \end{array}$$

...

**Lemma 7.** *Some commutative diagram:*

$$\begin{array}{ccc} X \times_S Y & \longrightarrow & X \\ \downarrow & & \downarrow \\ Y & \longrightarrow & S \end{array}$$

`listhack=true|false` (initially false)

Meant only to be used with the `break`<sup>P. 7</sup> style key for a theorem starting with a list. Compare:

```
% preamble
\newkeytheoremstyle{breaksty}{break}
\newkeytheorem{observation}[style=breaksty]

% document
\begin{observation}
\begin{enumerate}
\item First item
\end{enumerate}
\end{observation}

\begin{observation}[listhack=true]
\begin{enumerate}
\item First item
\end{enumerate}
\end{observation}
```

**Observation 1.** *1. First item*

**Observation 2.**

*1. First item*

Note that the value `true` must be explicitly set so that `listhack` is not interpreted as the note text.

## 4.2 Keys inherited from `thmtools`

These are the `[options]` available to `\newkeytheorem`. Except for `name` and `style`, each key below can also be used in `\newkeytheoremstyle`<sup>P.6</sup>. For more description, see the `thmtools` package.

`name`= $\langle display\ name \rangle$  (initially title-cased  $\langle env\ name \rangle$ )

Aliases `title` and `heading`.

<pre>% preamble \newkeytheorem{mythm}[name=Some Name]  % document \begin{mythm} Some text \end{mythm}</pre>	<p><b>Some Name 1.</b> <i>Some text</i></p>
---	---

`numbered`=`true`|`false`|`unless-unique` (default `true`, initially `true`)

For compatibility with `thmtools`, also accepts the values `yes`, `no`, and `unless unique`.

<pre>% preamble \newkeytheorem{theorem*}[   name=Theorem, numbered=false ]  % document \begin{theorem*} An unnumbered theorem. \end{theorem*}</pre>	<p><b>Theorem.</b> <i>An unnumbered theorem.</i></p>
---	--

`parent`= $\langle counter \rangle$  (initially unset)

Aliases `numberwithin` and `within`.

<pre>% preamble \newkeytheorem{conjecture}[parent=section]  % document \begin{conjecture} The first number is the section. \end{conjecture}</pre>	<p><b>Conjecture 4.1.</b> <i>The first number is the section.</i></p>
---	---

`sibling`= $\langle counter \rangle$  (initially unset)

Aliases `numberlike` and `sharenumber`.

<pre>% preamble \newkeytheorem{lemma}[sibling=theorem]  % document \begin{lemma} This shares its counter with \texttt{theorem}. \end{lemma}</pre>	<p><b>Lemma 8.</b> <i>This shares its counter with theorem.</i></p>
---	---

`style`= $\langle style\ name \rangle$  (initially unset)

Accepts any  $\langle style\ name \rangle$  defined by `\newkeytheoremstyle`<sup>P.6</sup>, as well as any of the predefined `amsthm` styles: `plain`, `definition`, and `remark`.

```
% preamble
\newkeytheorem{remark}[style=remark]

% document
\begin{remark}
Some text
\end{remark}
```

*Remark 1.* Some text

`preheadhook`= $\langle code \rangle$  (initially unset)  
`postheadhook`= $\langle code \rangle$  (initially unset)  
`prefoothook`= $\langle code \rangle$  (initially unset)  
`postfoothook`= $\langle code \rangle$  (initially unset)

Details in section 8.

```
% preamble
\newkeytheorem{test}[
  preheadhook=PREHEAD,
  postheadhook=POSTHEAD,
  prefoothook=PREFOOT,
  postfoothook=POSTFOOT
]

% document
\begin{test}
Some text
\end{test}
```

PREHEAD

**Test 1.** *POSTHEAD*Some text *PREFOOT*

POSTFOOT

`refname`= $\langle ref\ name \rangle$  or  $\{\langle singular\ name \rangle, \langle plural\ name \rangle\}$  (initially  $\langle display\ name \rangle$ )

If a single string, then the name used by `hyperref`'s `\autoref` and `cleveref`'s `\cref`. If two strings separated by a comma, then the second string is the plural form used by `\cref`.

`Refname`= $\langle ref\ name \rangle$  or  $\{\langle singular\ name \rangle, \langle plural\ name \rangle\}$  (initially  $\langle display\ name \rangle$ )

Same as `refname` but for `\Autoref` and `\Cref`.

```
% preamble
\newkeytheorem{prop}[
  name=Proposition,
  refname={proposition,propositions},
  Refname={Proposition,Propositions}
]

% document
\begin{prop}[label=abc]
Some text
\end{prop}
\begin{prop}[label=def]
Some more text
\end{prop}
\begin{theorem}
Consider \cref{abc,def}.
\Autoref{abc} \dots
\end{theorem}
```

**Proposition 1.** *Some text*

**Proposition 2.** *Some more text*

**Theorem 9.** *Consider propositions 1 and 2. Proposition 1 ...*

`qed`= $\langle symbol \rangle$  (default `\openbox`, initially unset)

Adds  $\langle symbol \rangle$  to the end of the theorem body. If no value is given, the symbol  $\square$  is used.

```

% preamble
\newkeytheorem{example}[qed]
\newkeytheorem{solution}[qed=$\clubsuit$]

% document
\begin{example}
Some text
\end{example}
\begin{solution}
Some more text
\end{solution}

```

**Example 1.** *Some text* □

**Solution 1.** *Some more text* ♣

### 4.3 Keys added by `keytheorems`

`tcolorbox={\tcolorbox options}` (initially unset)

This key specifies that the theorem be placed inside a `tcolorbox` environment with `\tcolorbox` options. The theorem head is typeset as a `tcolorbox` title; to avoid this see `tcolorbox-no-titlebar`.

```

% preamble
\tcbset{
  defstyle/.style={
    arc=0mm,
    colback=blue!5!white,
    colframe=blue!75!black
  },
}
\newkeytheorem{corollary}[tcolorbox]
\newkeytheorem{definition}[
  style=definition,
  tcolorbox={defstyle}
]

% document
\begin{corollary}
Some text
\end{corollary}
\begin{definition}
Some more text
\end{definition}

```

**Corollary 1.**

*Some text*

**Definition 1.**

Some more text

`tcolorbox-no-titlebar={\tcolorbox options}` (initially unset)

Same usage as `tcolorbox` but the theorem head is typeset as usual, not as a `tcolorbox` title.

```

% preamble
\newkeytheorem{boxcor}[
  tcolorbox-no-titlebar={
    colback=red!10
  },
  name=Corollary,sibling=corollary
]

% document
\begin{boxcor}
Some text
\end{boxcor}

```

**Corollary 2.** *Some text*

## 5 Theorem Styles

`\newkeytheoremstyle{\name}{\options}`

This is `keytheorems`' version of `thmtools`' `\declaretheoremstyle[⟨options⟩]{⟨name⟩}`. Since it makes little sense to define a style with no keys, we've made the `⟨options⟩` argument mandatory. Note that unlike `amsthm`'s `\newtheoremstyle`, this command will error if a style has already been defined. To overwrite an existing style, there is the analogous `\renewkeytheoremstyle`. For completeness, there is also `\declarekeytheoremstyle` and `\providekeytheoremstyle`.

! For the AMS classes `amsart`, `amsbook`, and `amsproc`, as well as the `amsart`-based `acmart`, the initial key values are slightly different than what's below in order to match those class's defaults.

## 5.1 Keys inherited from `thmtools`

The following keys have the same meaning and syntax as the corresponding `thmtools` keys. In addition to the list below, most of the keys available to `\newkeytheorem`<sup>P.2</sup> can be used in `\newkeytheoremstyle`.

`spaceabove=⟨length⟩` (initially `\topsep`)

`spacebelow=⟨length⟩` (initially `\topsep`)

`bodyfont=⟨font declarations⟩` (initially `\itshape`)

`headindent=⟨length⟩` (initially `0pt`)

`headfont=⟨font declarations⟩` (initially `\bfseries`)

`headpunct=⟨code⟩` (initially `{.}`)

`postheadspace=⟨length⟩` (initially 5pt plus 1pt minus 1pt)

Do not use this with the `break` key.

`break` (initially unset)

Do not use this with the `postheadspace` key.

`notefont=⟨font declarations⟩` (initially `\fontseries\mddefault\upshape`)

`notebraces={⟨left brace⟩}{⟨right brace⟩}` (initially `{(}{)}`)

`headstyle=margin|swapnumber|⟨code using \NAME, \NUMBER, and \NOTE⟩`

Alias `headstyle`. Within `⟨code⟩`, the commands `\NAME`, `\NUMBER`, and `\NOTE` correspond to the formatted parts of the theorem head.

## 5.2 Keys added by `keytheorems`

`inherit-style=⟨style name⟩` (initially unset)

Inherit the keys of any style declared with `\newkeytheoremstyle`<sup>P.6</sup>. Additionally, the three styles predefined by `amsthm` are possible values: `plain`, `definition`, and `remark`.

## 6 Restating Theorems

When a theorem is given the `store`<sup>P.3</sup> key, the contents of the theorem are saved and written to a `.thlist` file. At the start of the next run, this file is input at the beginning of the document and allows you to retrieve the stored theorems at any point, before or after the original theorem.

`\getkeytheorem[⟨property⟩]{⟨tag⟩}`

Retrieves the theorem given the key `store=⟨tag⟩`. An optional `⟨property⟩` can be given to retrieve only the corresponding part of the theorem. Currently only the property `body` is implemented, which retrieves the (unformatted) body of the theorem.

```
\getkeytheorem{mytag}
```

```
\begin{example}[store=mytag]
```

```
Fascinating example.
```

```
\end{example}
```

```
\getkeytheorem[body]{mytag}
```

**Example 2.** *Fascinating example.* ☐

**Example 2.** *Fascinating example.* ☐

Fascinating example.

## 7 Listing Theorems

```
\listofkeytheorems[⟨options⟩]
```

```
\keytheoremset{⟨options⟩}
```

```
\listofkeytheorems
```

### List of Theorems

1	Theorem . . . . .	2
2	Theorem (some heading) . . . .	2
3	Theorem (some heading) . . . .	2
4	Theorem (another heading) . .	2
5	Theorem . . . . .	2
5	Theorem (continuing from p. 2)	3
6	Theorem . . . . .	3
7	Lemma . . . . .	3
1	Observation . . . . .	3
2	Observation . . . . .	3
1	Some Name . . . . .	4
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8	Lemma . . . . .	4
1	Remark . . . . .	4
1	Test . . . . .	5
1	Proposition . . . . .	5
2	Proposition . . . . .	5
9	Theorem . . . . .	5
1	Example . . . . .	5
1	Solution . . . . .	5
1	Corollary . . . . .	6
1	Definition . . . . .	6
2	Corollary . . . . .	6
2	Example . . . . .	7

### 7.1 Keys inherited from thmtools

**numwidth**=⟨length⟩ (initially 2.3em)

**ignore**={⟨comma-list of env names⟩} (initially unset)

**show**={⟨comma-list of env names⟩} (initially all theorems)

**onlynamed**={⟨comma-list of env names⟩} (initially unset)

**ignoreall** (initially unset)



```
\listofkeytheorems[ignoreall,show=theorem]
\listofkeytheorems[
  ignoreall, show=conjecture,
  title=List of Conjectures
]
```

## List of Theorems

1	Theorem . . . . .	2
2	Theorem (some heading) . . .	2
3	Theorem (some heading) . . .	2
4	Theorem (another heading) .	2
5	Theorem . . . . .	2
5	Theorem (continuing from p. 2) . . . . .	3
6	Theorem . . . . .	3
9	Theorem . . . . .	5

## List of Conjectures

4.1	Conjecture . . . . .	4
-----	----------------------	---

`showall` (initially set)

`title=<text>` (initially `\GetTranslation{keythms_listof_title}`)

Defaults to “List of Theorems” if English or an unknown language is used. Currently French, German, and Spanish have (probably bad!) translations. A translation can be added with a Github pull request or manually with `\DeclareTranslation{<lang>}{keythms_listof_title}{<text>}`.

`swapnumber=true|false` (initially false)

## 7.2 Keys added by `keytheorems`

`onlynumbered={<comma-list of env names>}` (initially unset)

Similar to `onlynamed`<sup>P.8</sup>, but lists only those theorems which are numbered. This is useful if you’d like to exclude things like unnumbered definitions and remarks from the list of theorems.

`title-code=<code with #1>` (initially `\section*{#1}`)

If `\chapter` is defined, then initially this is instead `\chapter*{#1}`.

`no-title` (initially unset)

Suppresses the title of the list of theorems. Useful for custom ordering of the list.

```
\keytheoremset{ignoreall}
\listofkeytheorems[show=example]
\listofkeytheorems[show=solution,no-title]
```

## List of Theorems

1	Example . . . . .	5
2	Example . . . . .	7
1	Solution . . . . .	5

`note-code=<code with #1>` (initially `{ ( #1 ) }`)

Formats the optional note in the list of theorems.

`print-body` (initially unset)

Instead of listing the theorem headings, the theorems are restated with their body text. Not very useful without the `store-all`<sup>P.1</sup> load-time option.

`no-continues=true|false` (initially false)

Suppresses the printing of theorems given the `continues`<sup>P.3</sup> key in the list of theorems.

`no-chapter-skip=true|false` (initially false)

By default a small vertical space is inserted between each chapter’s chunk of theorems. Setting this key to `true` removes this space.

`chapter-skip-length=<dimension>` (initially 10pt)

Controls the amount of space inserted between chunks.

## 7.3 Adding code to list of theorems

There are analogous commands to `\addcontentsline` and `\addtocontents` for adding entries or arbitrary code to the list of theorems.



You *must* use these commands rather than the aforementioned because the `.thlist` file is also used to define restated theorems and cannot contain unexpected code.

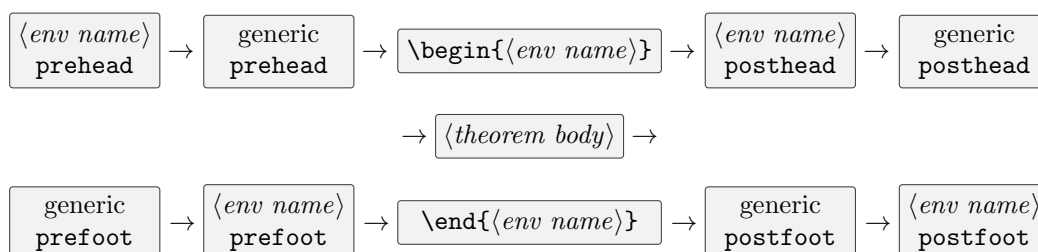
`\addtheoremcontentsline{<level>}{<text>}`

`\addtotheoremcontents{<code>}`

## 8 Theorem Hooks

`\addtotheoremhook[<env name>]{<hook name>}{<code>}`

`<hook name>` can be `prehead`, `posthead`, `prefoot`, `postfoot`, or `restated`. If no `<env name>` is given, the `<code>` is added to the “generic” hook, i.e. applied to all theorems. As in `thmtools`, the order of hooks is as follows:



The `restated` hook is applied at the start of theorems retrieved with `\getkeytheorem`, before the `prehead` hook. This can be useful for disabling commands such as `\footnote` in the restated theorems, e.g.

```

\addtotheoremhook{restated}{%
  \renewcommand\footnote[2][]{}%
}

```

By default, `keytheorems` disables the `\label` and `\RecordProperties` commands in restated theorems.

In `thmtools`, the `prefoot` and `postfoot` hooks always prepend code, i.e. the code

```

\addtotheoremhook{postfoot}{A}
\addtotheoremhook{postfoot}{B}

```

results in BA after the theorem. With `keytheorems`, code is added in the order declared, meaning

```

\addtotheoremhook{postfoot}{A}
\addtotheoremhook{postfoot}{B}

```

results in AB after the theorem. This is the behavior of the L<sup>A</sup>T<sub>E</sub>X kernel hooks that `keytheorems` uses under the hood.

Right now, code added using the hook keys `preheadhook`<sup>→P.5</sup>, etc. is outermost, meaning executed first in `prehead` and `posthead` and last in `prefoot` and `postfoot`. This may change if I think of good reasons to do so...

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