keytheorems package

version 0.1.4dev

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. Several issues encountered with thmtools are avoided (see the README for a list) and a few new features are added.

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1 Dependencies

Without using the $tcolorbox^{\rightarrow P.7}$ or $tcolorbox-no-titlebar^{\rightarrow P.7}$ options, the package loads the aliasent, amsthm, refcount, translations, and unique packages. A LATEX kernel no older than 2023-06-01 is required; if older than 2024-06-01, nameref is required.

2 Global Options

$\keytheoremset{\langle options \rangle}$

Every key in this section can be given as a package option with $\scalebox{usepackage}[\langle options \rangle]$ {keytheorems} or in $\scalebox{keytheoremset}\{\langle options \rangle\}$, with the exception that continues-code and only be used in the latter.

overload (initially unset)

Redefines \newtheorem to internally use the keytheorems machinery. The syntax remains the same. This is automatically set by thmtools-compat.

thmtools-compat (initially unset)

For compatibility with thmtools syntax. Currently defines the commands in the left column below. The right column lists the corresponding keytheorems replacement that should be used in new documents.

thmtools command	keytheorems replacement
\declaretheorem	\newkeytheorem
\declaretheoremstyle	$\verb+\newkeytheoremstyle^{ ightarrow P.8}$
\listoftheorems	$ackslash ext{listofkeytheorems}^{ ightarrow ext{P.}10}$
\addtotheorempreheadhook	
\addtotheorempostheadhook	$\addtotheoremhook \rightarrow P.12$
\addtotheoremprefoothook	\addtotheoremnook
\addtotheorempostfoothook	
restatable environment	$\mathtt{store}^{\to\mathrm{P.}4}\mathrm{key}$
restatable* environment	$\mathtt{store*}^{\to\mathrm{P.}4}\;\mathrm{key}$

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 $^{-P.12}$ option of $\$ Note that this means a theorem body cannot contain verbatim material.

```
restate-counters=\{\langle comma-list \ of \ counters \rangle\}
```

(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 $\langle comma-list \rangle$.

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

The code used to typeset the note produced by the continues $^{-P.3}$ key. If English or an unknown language is used, defaults to continuing from p.\,\pageref{#1}. Currently (likely inaccurate!) translations exist for French, German, Italian, Portuguese, and Spanish.

```
qed-symbol=\langle symbol \rangle
```

(initially \openbox)

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

```
auto-translate=true|false
```

(default true, initially true)

If false, keytheorems does not automatically translate the title text for $\$ listofkeytheorems $^{\to P.~10}$ and the note produced by the continues $^{\to P.~3}$ key. These texts can be manually customized with the title $^{\to P.~11}$ and continues-code keys, respectively.

store-sets-translate

(initially unset)

Defines the $\mathtt{store}^{\to P.4}$ key to also set $\mathtt{label}^{\to P.3}$, i.e. it makes $\mathtt{store} = \langle tag \rangle$ equivalent to $\mathtt{store} = \langle tag \rangle$, $\mathtt{label} = \langle tag \rangle$. Similarly for $\mathtt{store} *^{\to P.4}$.

3 Defining Theorems

 $\new keytheorem \{\langle env \ name \rangle\} [\langle options \rangle]$

Defines a theorem environment $\langle env \; name \rangle$ which itself takes a few options (see subsection 3.1). You can also declare multiple theorems at once by replacing $\langle env \; name \rangle$ with a comma-list of names, e.g. $\mbox{newkeytheorem{theorem,lemma,proposition}[\langle options \rangle]}$.

By default, the theorem's printed name is a title-cased $\langle env \; name \rangle$. This can be changed with the name $^{\rightarrow P.5}$ key. All $\langle options \rangle$ are described in subsections 3.2 and 3.3.

% preamble
\newkeytheorem{theorem}

% document
\begin{theorem}
Some text
\end{theorem}
Theorem 1. Some text

3.1 Keys available to theorem environments

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

<pre>\begin{theorem}[some heading] Some text \end{theorem}</pre>	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
\end{theorem}

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

Alias short-name. This replaces the value of note when displayed in \listofkeytheorems P. 10.

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

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

\begin{theorem}[label=foo] Some text \end{theorem}	Theorem 5. Some text
\ref{foo}	5

continues*= $\langle label\ name \rangle$

(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- $code^{\rightarrow P.2}$ 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. 3). ... and some more text.

 $store*=\langle tag \rangle$ (initially unset)

Alias restate*. Stores the the theorem to be restated at any point in the document with \getkeytheorem \delta P.9. With the starred version, counters and labels are taken from the copy called with \getkeytheorem, so in this case can only be restated once. This allows you, for example, to write all theorems and proofs in the appendix and call \getkeytheorem at the appropriate time mid-document.

```
\begin{theorem}[store=blub]
                                              Theorem 6. A theorem worth restating.
A theorem worth restating.
\end{theorem}
                                              More brilliant mathematics.
More brilliant mathematics.
                                              Theorem 6. A theorem worth restating.
\getkeytheorem{blub}
```

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
                                                         Lemma 7. Some commutative diagram:
\usepackage{tikz}
\usetikzlibrary{cd}

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

% document
\begin{lemma}[store=diagram]
Some commutative diagram:
\[\begin{tikzcd} [ampersand

    replacement=\&]

X\times_S Y \ar[r] \ar[d] \& X \ar[d]
                                                         Lemma 7. Some commutative diagram:
Y \ar[r] \& S
                                                                         \end{tikzcd}\]
\end{lemma}
\dots
\getkeytheorem{diagram}
```

listhack=true|false

(initially false)

Meant only to be used with the break^{→P.8} style key for a theorem starting with a list. Compare:

```
\newkeytheoremstyle{breaksty}{break}
\newkeytheorem{observation}[style=breaksty]
% document
\begin{observation}
                                              Observation 1. 1. First item
\begin{enumerate}
\item First item
                                              Observation 2.
\end{enumerate}
\end{observation}
                                                 1. First item
\begin{observation}[listhack=true]
\begin{enumerate}
\item First item
\end{enumerate}
\end{observation}
```

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

 $seq=\langle name \rangle$ (initially unset)

Adds the theorem to a custom sequence $\langle name \rangle$ that can then be listed with \listofkeytheorems[seq= $\langle name \rangle$]. See $seq^{\rightarrow P.11}$ for more details.

3.2 Keys inherited from thmtools

These are the $\lceil \langle options \rangle \rceil$ available to \newkeytheorem. Except for name $^{P.5}$ and style $^{P.5}$, each key below can also be used in \newkeytheoremstyle $^{P.8}$. For more description, see the thmtools package.

 $name = \langle display \ name \rangle$

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

Aliases title and heading.

```
% preamble
\newkeytheorem{mythm} [name=Some Name]

% document
\begin{mythm}
Some text
\end{mythm}
Some 1. Some text
```

numbered=true|false|unless-unique

(default true, initially true)

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

 $parent=\langle counter \rangle$

(initially unset)

Aliases number within and within.

```
% preamble
\newkeytheorem{conjecture}[parent=section]

% document
\begin{conjecture}
The first number is the section.
\end{conjecture}
Conjecture 3.1. The first number is the section.
```

 $sibling=\langle counter \rangle$

(initially unset)

Aliases numberlike and sharenumber.

```
% preamble
\newkeytheorem{lemma}[sibling=theorem]

% document
\begin{lemma}
This shares its counter with
\texttt{theorem}.
\end{lemma}
Lemma 8. This shares its counter with
theorem.
```

 $style=\langle style \ name \rangle$

(initially unset)

Accepts any $\langle style \ name \rangle$ defined by $\newkeytheoremstyle^{\rightarrow P.8}$, 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}
```

```
\begin{array}{ll} \operatorname{preheadhook} = \langle code \rangle & \text{(initially unset)} \\ \operatorname{postheadhook} = \langle code \rangle & \text{(initially unset)} \\ \operatorname{prefoothook} = \langle code \rangle & \text{(initially unset)} \\ \operatorname{postfoothook} = \langle code \rangle & \text{(initially unset)} \\ \end{array}
```

Details in section 7.

```
refname=\langle refname \rangle or \{\langle singular\ name \rangle, \langle plural\ 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.

(initially $\langle display \ name \rangle$)

```
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. Note that \Autoref is defined by keytheorems, but requires hyperref to work. As with \autoref, there is also a starred version \Autoref* that suppresses the hyperlink.

```
% preamble
\newkeytheorem{prop}[
  name=Proposition,
  refname={proposition,propositions},
  Refname={Proposition,Propositions}
                                              Proposition 1. Some text
% document
\begin{prop}[label=abc]
                                              Proposition 2. Some more text
Some text
                                              Theorem 9. Consider propositions 1
\end{prop}
\begin{prop}[label=def]
                                              and 2. Proposition 1 . . .
Some more text
\end{prop}
\begin{theorem}
Consider \cref{abc,def}.
\Autoref{abc} \dots
\end{theorem}
```

```
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

$\delta$
$\de
```

3.3 Keys added by keytheorems

```
tcolorbox = \{\langle tcolorbox \ options \rangle\}
```

(initially unset)

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

```
% preamble
\tcbset{
  defstyle/.style={
    arc=0mm,
    colback=blue!5!white,
    colframe=blue!75!black
    },
                                                  Corollary 1.
\newkeytheorem{corollary}[tcolorbox]
                                                  Some text
\newkeytheorem{definition}[
  style=definition,
  tcolorbox={defstyle}
                                                  Definition 1.
                                                  Some more text
% document
\begin{corollary}
Some text
\end{corollary}
\begin{definition}
Some more text
\end{definition}
```

 $tcolorbox-no-titlebar=\{\langle tcolorbox\ options \rangle\}$

(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
]

Corollary 2. Some text

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

tcolorbox offers its own comprehensive theorems library. If all of your theorems are to be tcolorboxes, I highly recommend using it instead of this package! However, if only some of your theorems will use a tcolorbox, you may want to replicate the styles of <code>\NewTcbTheorem</code>. Here is an example that emulates tcolorbox's standard theorem style.

```
% preamble
\tcbset{
  thmstyle/.style={
    colback=green!5,
    colframe=green!35!black},
\newkeytheoremstyle{tcb-standard}{
  tcolorbox=thmstyle,
  headpunct={},
 notebraces={}{},
                                                    My Theorem 1: This is my title
  noteseparator={: },
  notefont=\bfseries,
                                                    Some theorem text
  bodyfont=\normalfont,
\newkeytheorem{mytheo}[
  name=My Theorem,
  style=tcb-standard]
% document
\begin{mytheo}[This is my title]
Some theorem text
\end{mytheo}
```

4 Theorem Styles

 $\mbox{\ensuremath} \mbox{\ensuremath} \mbox{\ensu$

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

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.

4.1 Keys inherited from thmtools

Do not use this with the postheadspace key.

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^{-\text{P.2}} can be used in \newkeytheoremstyle.

```
spaceabove = \langle length \rangle
                                                                                                              (initially \topsep)
spacebelow=\langle length \rangle
                                                                                                             (initially \topsep)
bodyfont = \langle font \ declarations \rangle
                                                                                                            (initially \itshape)
headindent = \langle length \rangle
                                                                                                                    (initially Opt)
headfont = \langle font \ declarations \rangle
                                                                                                          (initially \bfseries)
headpunct=\langle code \rangle
                                                                                                                    (initially {.})
postheadspace=\langle length \rangle
                                                                                      (initially 5pt plus 1pt minus 1pt)
      Do not use this with the break key.
break
                                                                                                                 (initially unset)
```

```
notebraces = {\langle left \ brace \rangle} {\langle right \ brace \rangle}
```

(initially $\{(\}\{)\}$)

headformat=margin|swapnumber| $\langle code\ using\ \backslash NAME,\ \backslash NUMBER,\ and\ \backslash NOTE\rangle$

Alias headstyle. Within $\langle code \rangle$, the commands **\NAME**, **\NUMBER**, and **\NOTE** correspond to the formatted parts of the theorem head.

4.2 Keys added by keytheorems

```
noteseparator = \langle code \rangle
```

(initially ⊔)

The code inserted before the note, and printed only if there is a note. This is executed before the font commands set by notefont take effect.

```
numberfont = \langle font \ declarations \rangle
```

(initially)

For almost all theorem styles, it is recommended that you do not change this setting.

```
inherit-style=\langle style \ name \rangle
```

(initially unset)

Inherit the keys of any style declared with \newkeytheoremstyle \(^{-P.8}\). Additionally, the three styles predefined by amsthm are possible values: plain, definition, and remark.

5 Restating Theorems

When a theorem is given the store P.4 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.

$\getkeytheorem[\langle property \rangle] \{\langle tag \rangle\}$

Retrieves the theorem given the key $store=\langle tag \rangle$ or $store*=\langle tag \rangle$. An optional $\langle property \rangle$ 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.

```
\label{eq:liftestatingTf} $$ \left( \operatorname{true\ code} \right) \left( \operatorname{false\ code} \right) \\ \left( \operatorname{false\ code} \right) \\ \left( \operatorname{false\ code} \right) \\
```

Executes $\langle true\ code \rangle$ if being retrieved with \getkeytheorem and $\langle false\ code \rangle$ if in the original theorem. This is reversed if store* is used.

\begin{example}[store=hmm]	
I am the	Example 3. I am the original exam-
\IfRestatingTF{restated}{original}	ple!
example!	
\end{example}	Example 3. I am the restated exam-
	ple!
\getkeytheorem{hmm}	

6 Listing Theorems

$\label{listofkeytheorems} [\langle options \rangle]$

Similar to \listoffigures or \listoftables but for theorems. For memoir and the AMS classes, keytheorems tries to copy the formatting of these commands as defined by the class. For other classes, manual adjustments to numwidth $^{\rightarrow P.~10}$ and indent $^{\rightarrow P.~11}$ may be necessary.

 $\key theorem list set {\langle options \rangle}$

	List of Theorems
\listofkeytheorems	1 Theorem 3 2 Theorem (some heading) 3 3 Theorem (some heading) 3 4 Theorem (another heading) 3 5 Theorem 3 5 Theorem (continuing from p. 3) 3 6 Theorem 4 7 Lemma 4 1 Observation 4 2 Observation 4 1 Some Name 5 Theorem 5 3.1 Conjecture 5 8 Lemma 5 1 Remark 5 1 Test 6 1 Proposition 6 2 Proposition 6 3 Example 7 1 Definition 7 2 Corollary 7 1 My Theorem (This is my title) 7 2 Example 9 3 Example 9

6.1 Keys inherited from thmtools

	List of Theorems
\listofkeytheorems[ignoreall,show=theorem] \listofkeytheorems[ignoreall, show=conjecture, title=List of Conjectures]	1 Theorem 3 2 Theorem (some heading) 3 3 Theorem (some heading) 3 4 Theorem (another heading) 3 5 Theorem 3 5 Theorem (continuing from p. 3) 3 6 Theorem 4 9 Theorem 6
	List of Conjectures 3.1 Conjecture 5

showall (initially set)

 $title=\langle text \rangle$

(initially \GetTranslation{keythms_listof_title})

Defaults to "List of Theorems" if English or an unknown language is used. Currently French, German, Italian, Portuguese, and Spanish have (likely inaccurate!) translations. A translation can be added with a GitHub pull request or manually with $\DeclareTranslation{\langle lang \rangle}{\keythms_listof_title}{\langle text \rangle}$

swapnumber=true|false

(initially false)

6.2 Keys added by keytheorems

 $indent = \langle length \rangle$ (initially 1.5em)

Sets the left indent of items in the list of theorems. For memoir and the AMS classes, the indent is initially Opt. It is not recommended to change this unless your class has different defaults not already covered.

onlynumbered= $\{\langle comma-list\ of\ env\ names \rangle\}$

(initially unset)

Similar to onlynamed P. 10, 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.

 $seg=\langle name \rangle$ (initially unset)

Used to list only the theorems added to the custom sequence $\langle name \rangle$ with the $\operatorname{seq}^{\to P.4}$ theorem key. This is the only way to fully customize which theorems appear in the list of theorems. Unlike with $\operatorname{show}^{\to P.10}$, you do not need to use $\operatorname{ignoreall}^{\to P.10}$ to prevent theorems not in $\langle name \rangle$ from being printed.

title-code= $\langle code \ with \ #1 \rangle$

(initially \section*{#1})

If \chapter is defined, then initially this is instead \chapter*{#1}. This key has no effect if used with an AMS class because these classes hard-code the section heading into \@starttoc.

no-title=true|false

(initially false)

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

	List of Theorems
\keytheoremlistset{ignoreall} \listofkeytheorems[show=example] \listofkeytheorems[show=solution,no-title]	1 Example 6 2 Example 9 3 Example 9 1 Solution 6

```
note-code=(code \ with \ \#1)  (initially { (\pm 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^{¬P. 2} load-time option.

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

Suppresses the printing of theorems given the continues P.3 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=\langle dimension \rangle  (initially 10pt)
```

Controls the amount of space inserted between chunks.

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

With the standard classes, lists of figures/tables are not added to the table of contents by default. The same is true for \listofkeytheorems, and with those classes this key does nothing. However some classes, notably memoir and the AMS classes, do add lists to the table of contents. With these classes, this key suppresses the addition of the list of theorems to the table of contents.

6.3 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.

 $\addtheoremcontentsline{\langle level \rangle} {\langle text \rangle}$

 $\addtotheoremcontents{\langle code \rangle}$

7 Theorem Hooks

```
\addtotheoremhook[\langle env\ name \rangle] \{\langle hook\ name \rangle\} \{\langle code \rangle\}
```

 $\langle hook\ name \rangle$ can be prehead, posthead, prefoot, postfoot, or restated. If no $\langle env\ name \rangle$ is given, the $\langle code \rangle$ is added to the "generic" hook, i.e. applied to all theorems. As in thmtools, the order of hooks is as follows:

```
\langle env \ name \rangle
                           generic
                                                                                                                  generic
 prehead
                          prehead
                                                                                                                posthead
                                                     \langle theorem\ body \rangle
                        \langle env \ name \rangle
                                                                                                               \langle env \ name \rangle
  generic
                                                                                          generic
                                                  \end{\langle env \ name \rangle}
                         prefoot
 prefoot
                                                                                        postfoot
                                                                                                                postfoot
```

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

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

results in AB after the theorem. This is the behavior of the \LaTeX kernel hooks that keytheorems uses under the hood.

Right now, code added using the hook keys preheadhook $^{\rightarrow P.6}$, 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...

8 Further examples

More examples will be added soon – rather, eventually... For now, you can find a keytheorems adaptation of amsthm's classic file thmtest.tex in the Github tests folder: keytheorems-amsthmtest.tex.

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