

# keytheorems package

version 0.2.7

[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`. 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

The package depends on the `aliascnt`, `amsthm`, `refcount`, and `translations` packages. The `tcolorbox`<sup>→P.12</sup> and `tcolorbox-no-titlebar`<sup>→P.13</sup> keys require `tcolorbox`, and the `numbered=unless-unique`<sup>→P.8</sup> key requires the `unique` package. A L<sup>A</sup>T<sub>E</sub>X kernel no older than 2023-06-01 is required; if older than 2024-06-01, `nameref` is required.

## 2 Global options

`\keytheoremset`{*options*}

Every key in this section can be given as an option to `\usepackage` or in `\keytheoremset`, with the exception that `continues-code`<sup>→P.3</sup> can only be used in the latter.

### 2.1 Compatibility options

`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. For most documents,

```
\usepackage[thmtools-compat]{keytheorems}
```

should be a drop-in replacement for `\usepackage{amsthm,thmtools}`. The option 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
<code>\declaretheorem</code>	→ <code>\newkeytheorem</code> <sup>→P.3</sup>
<code>\declaretheoremstyle</code>	→ <code>\newkeytheoremstyle</code> <sup>→P.14</sup>
<code>\listoftheorems</code>	→ <code>\listofkeytheorems</code> <sup>→P.17</sup>
<code>\listtheoremname</code>	→ <code>title</code> <sup>→P.19</sup> key
<code>\addtotheoremheadhook</code>	
<code>\addtotheoremheadhook</code>	→ <code>\addtotheoremhook</code> <sup>→P.20</sup>
<code>\addtotheoremfoothook</code>	
<code>\addtotheoremfoothook</code>	
<code>restatable</code> environment	→ <code>store</code> <sup>→P.5</sup> key
<code>restatable*</code> environment	→ <code>store*</code> <sup>→P.5</sup> key

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

### 2.2 Other global options

`auto-translate=true|false` (default `true`, initially `true`)

If `false`, `keytheorems` does not automatically translate the title text used for `\listofkeytheorems`<sup>→P.17</sup> and the note produced by the `continues`<sup>→P.5</sup> key. These texts can be manually customized with the `title`<sup>→P.19</sup> and `continues-code`<sup>→P.3</sup> keys, respectively.

`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.5</sup> key. If English or an unknown language is used, defaults to `continuing from p.\, \pageref{#1}`. Currently (likely inaccurate!) translations exist for several European languages.

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

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

`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* $\rangle$ .

`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.20</sup> option of `\listofkeytheorems`<sup>→P.17</sup>. Note that this means a theorem body *cannot* contain verbatim material.

`store-sets-label` (initially unset)

Defines the `store`<sup>→P.5</sup> key to also set `label`<sup>→P.4</sup>, i.e. it makes `store`= $\langle$ *tag* $\rangle$  equivalent to `store`= $\langle$ *tag* $\rangle$ , `label`= $\langle$ *tag* $\rangle$ . Similarly for `store*`<sup>→P.5</sup>.

### 3 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 3.1). 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}[\langleoptions $\rangle]$ .`

By default, the theorem's printed name is a title-cased  $\langle$ *env name* $\rangle$ . This can be changed with the `name`<sup>→P.8</sup> key. All  $\langle$ *options* $\rangle$  are described in subsections 3.2 and 3.3.

```
% preamble
\newkeytheorem{theorem}

% document
\begin{theorem}
There are infinitely many prime numbers.
\end{theorem}
```

**Theorem 1.** *There are infinitely many prime numbers.*

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

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

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

Sometimes a package or class defines theorems that need to be overwritten by the user. For this case, `keytheorems` provides `\renewkeytheorem` which redefines  $\langle env name \rangle$  or errors if it is not defined. For completeness, also provided are `\providekeytheorem` and `\declarekeytheorem`. The former only defines  $\langle env name \rangle$  if it is not already defined; the latter always overwrites  $\langle env name \rangle$ .

### 3.1 Keys available to theorem environments

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

```
\begin{theorem}[Bertrand's postulate]
For every  $n \geq 1$ , there is a prime number  $p$  with  $n < p \leq 2n$ .
\end{theorem}
```

**Theorem 2** (Bertrand's postulate). *For every  $n \geq 1$ , there is a prime number  $p$  with  $n < p \leq 2n$ .*

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}[note=Legendre's formula]
The number  $n!$  contains the prime factor  $p$  exactly
 $\sum_{k \geq 1} \lfloor \frac{n}{p^k} \rfloor$ 
times.
\end{theorem}
```

**Theorem 3** (Legendre's formula). *The number  $n!$  contains the prime factor  $p$  exactly*

$$\sum_{k \geq 1} \left\lfloor \frac{n}{p^k} \right\rfloor$$

*times.*

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

Alias `short-name`. This replaces the value of `note` when displayed in the list of theorems (`\listofkeytheorems`<sup>[→P.17](#)</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=bezout,note=Bézout's identity]
Let  $a$  and  $b$  be integers. Then there exist integers  $x$  and  $y$ 
such that  $ax+by=\gcd(a,b)$ .
\end{theorem}
See \zcref{bezout}.
```

**Theorem 4** (Bézout's identity). *Let  $a$  and  $b$  be integers. Then there exist integers  $x$  and  $y$  such that  $ax + by = \gcd(a, b)$ .*

See theorem 4.

`manual-num=<text>` (initially unset)

Use this to override the printed number of a theorem. It is useful for making “starred” versions of other theorems, perhaps to represent a reformulated or more difficult version.

```
\begin{theorem}[manual-num=\ref*{bezout}*]
Let  $a_1, \dots, a_n$  be integers. Then there exist integers
 $x_1, \dots, x_n$  such that  $a_1x_1 + \dots + a_nx_n = \gcd(a_1, \dots, a_n)$ .
\end{theorem}
\begin{theorem}[manual-num=\faRocket] % requires fontawesome5
Don't confuse your readers by changing the numbering without good
reason.
\end{theorem}
```

**Theorem 4\***. *Let  $a_1, \dots, a_n$  be integers. Then there exist integers  $x_1, \dots, x_n$  such that  $a_1x_1 + \dots + a_nx_n = \gcd(a_1, \dots, a_n)$ .*

**Theorem 🚀**. *Don't confuse your readers by changing the numbering without good reason.*

`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`<sup>P.3</sup> option. The starred version also copies the theorem `note`<sup>P.4</sup> and `short-note`<sup>P.4</sup> if they are nonempty.

```
\begin{theorem}[continues=bezout]
Moreover, the integers of the form  $az+bt$  are exactly the multiples
of  $\gcd(a,b)$ .
\end{theorem}
\begin{theorem}[continues*=bezout]
Moreover, the integers of the form  $az+bt$  are exactly the multiples
of  $\gcd(a,b)$ .
\end{theorem}
```

**Theorem 4** (continuing from p. 4). *Moreover, the integers of the form  $az+bt$  are exactly the multiples of  $\gcd(a,b)$ .*

**Theorem 4** (Bézout's identity, continuing from p. 4). *Moreover, the integers of the form  $az + bt$  are exactly the multiples of  $\gcd(a,b)$ .*

`store*=<tag>` (initially unset)

Alias `restate*`. Stores the the theorem to be restated at any point in the document with `\getkeytheorem`<sup>P.16</sup>. 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. For the numbering to be correct, the unstarred key will need at most two runs and the starred key at most three runs.

```

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

```

**Theorem 5.** *A theorem worth restating.*

More brilliant mathematics.

**Theorem 5.** *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=fiberprod]
For any  $S$ -schemes  $X$  and  $Y$ , there exists a scheme  $X \times_S Y$ 
with morphisms to  $X$  and  $Y$  such that the diagram
\[\begin{tikzcd}[ampersand replacement=\&]
X \times_S Y \ar[r] \ar[d] \& X \ar[d] \\
Y \ar[r] \& S
\end{tikzcd}\]
commutes and is universal with respect to this property.
\end{lemma}
\dots
\getkeytheorem{fiberprod}

```

**Lemma 6.** *For any  $S$ -schemes  $X$  and  $Y$ , there exists a scheme  $X \times_S Y$  with morphisms to  $X$  and  $Y$  such that the diagram*

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

*commutes and is universal with respect to this property.*

...

**Lemma 6.** *For any  $S$ -schemes  $X$  and  $Y$ , there exists a scheme  $X \times_S Y$  with morphisms to  $X$  and  $Y$  such that the diagram*

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

*commutes and is universal with respect to this property.*

`restate-keys={\langle list of keys \rangle}` (initially unset)

Allows passing different keys to the restated theorem. At the moment this is only useful with the `note-P.4` key.

```
\begin{theorem}[
  store=rktest,
  note=Original,
  restate-keys={note=Restated}
]
Wow, yet another theorem.
\end{theorem}
\getkeytheorem{rktest}
```

**Theorem 7** (Original). *Wow, yet another theorem.*

**Theorem 7** (Restated). *Wow, yet another theorem.*

`listhack=true|false` (initially false)

Meant only to be used with the `break-P.14` 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
\item Second item
\end{enumerate}
\end{observation}

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

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

*2. Second item*

**Observation 2.**

*1. First item*

*2. Second item*

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`<sup>P.20</sup> for more details.

### 3.2 Keys also defined in thmtools

These are the [ $\langle options \rangle$ ] available to `\newkeytheorem`. Except for `name` and `style`<sup>P.9</sup>, each key below can also be used in `\newkeytheoremstyle`<sup>P.14</sup>. For more description, see the `thmtools` package.

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

Aliases `heading` and `title`.

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

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

**Some Name 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`.

```
% preamble
\newkeytheorem{theorem*}[name=Theorem, numbered=false]

% document
\begin{theorem*}
An unnumbered theorem.
\end{theorem*}
```

**Theorem.** *An unnumbered theorem.*

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

Aliases `numberwithin` 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 `sharennumber`.



```

% 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`=*(style name)* (initially unset)

Accepts any *(style name)* defined by `\newkeytheoremstyle`<sup>→P.14</sup>, as well as any of the predefined amsthm styles: `plain`, `definition`, and `remark`.

```

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

% document
\begin{remark}
It's nice to distinguish remarks from definitions and theorems.
\end{remark}

```

*Remark 1.* It's nice to distinguish remarks from definitions and theorems.

`preheadhook`=*(code)* (initially unset)

`postheadhook`=*(code)* (initially unset)

`prefoothook`=*(code)* (initially unset)

`postfoothook`=*(code)* (initially unset)

Details in section 7.

```

% 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

`qed`=*(symbol)* (default `\qedsymbol`, initially unset)

Adds *(symbol)* to the end of the theorem body. If no value is given, the symbol `\qedsymbol` 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.* ♣

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

If a single string, then the name used by hyperref's  $\backslash$ autoref, cleveref's  $\backslash$ cref, and zref-clever's  $\backslash$ zcreef. If two strings separated by a comma, then the second string is the plural form used by  $\backslash$ cref.

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

Same as **refname** but for  $\backslash$ Autoref,  $\backslash$ Cref, and  $\backslash$ zcreef with any of its capitalizing options. Note that  $\backslash$ Autoref is defined by keytheorems, but requires hyperref to work. As with  $\backslash$ autoref, there is also a starred version  $\backslash$ Autoref\* that suppresses the hyperlink.

```

% 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}
Consider \zcreef{abc,def}. \Autoref{abc} \dots

```

**Proposition 1.** *Some text.*

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

Consider propositions 1 and 2. Proposition 1 ...

Both cleveref and zref-clever define default reference names for some commonly used counters like theorem, lemma, etc. For technical reasons, unless explicit values for **refname** and **Refname** are given, keytheorems does not try to change these defaults at all in the case of cleveref and only the singular name in the case of zref-clever. The

easiest way to get exactly the output you want is to just explicitly set `refname` and `Refname`.

! The `cleveref`<sup>→CTAN</sup> package has not been updated since 2018 and contains several incompatibilities with the L<sup>A</sup>T<sub>E</sub>X kernel. These are often patched by the L<sup>A</sup>T<sub>E</sub>X team, but further incompatibilities are likely to arise with each future update. For this reason, I recommend moving to `zref-clever`<sup>→CTAN</sup>. It offers all the same features as `cleveref` and is actively maintained.

### 3.3 Keys added by keytheorems

`counter-format=<code>` (initially unset)

Syntactic sugar that essentially does `\renewcommand{\the<counter>}{<code>}`. The `<code>` should not contain any unexpandable tokens such as formatting commands. Formatting should be taken care of in the style keys `headfont`<sup>→P.14</sup> and `numberfont`<sup>→P.15</sup>. If used with an unnumbered theorem, a warning is issued.

```
% preamble
\newkeytheorem{mainthm}[
  name=Theorem,
  counter-format=\Alph{mainthm},
]

% document
\begin{mainthm}
The first main result, distinguished by using letters.
\end{mainthm}
\begin{mainthm}
And here is the second main result.
\end{mainthm}
```

**Theorem A.** *The first main result, distinguished by using letters.*

**Theorem B.** *And here is the second main result.*

Eventually L<sup>A</sup>T<sub>E</sub>X will allow syntax of the form `\Alph*` similar to `enumitem`'s `label` key, where the `*` means “use the current counter” (see `latex2e#1632`). Then the above example could be written as `counter-format=\Alph*`.

`leftmargin=<length>`

`rightmargin=<length>`

`margin=<length>` (initially 0pt)

Sets the left (respectively, right) margin of the theorem relative to the text width. The `margin` key sets both simultaneously. This sets the theorem apart from the text, similar to a block quote. The code was adapted from Enrico Gregorio's T<sub>E</sub>X Stack Exchange answers:

- How to change margins in enunciation (theorem-like environment)?
- A theoremstyle with complete indentation using `amsthm`

```
% preamble
\newcommand{\marginhtext}{%
  We need some text to show off theorems with margins. }
```

```

\newkeytheorem{quotethm}[name=Quote Theorem, margin=1cm]
\newkeytheorem{indentedthm}[name=Indented Theorem, leftmargin=1cm]

% document
\marginhtext\marginhtext\marginhtext

\begin{quotethm}
\marginhtext\marginhtext\marginhtext
\end{quotethm}

\marginhtext\marginhtext\marginhtext

\begin{indentedthm}
\marginhtext\marginhtext\marginhtext
\end{indentedthm}

```

We need some text to show off theorems with margins. We need some text to show off theorems with margins. We need some text to show off theorems with margins.

**Quote Theorem 1.** *We need some text to show off theorems with margins. We need some text to show off theorems with margins. We need some text to show off theorems with margins.*

We need some text to show off theorems with margins. We need some text to show off theorems with margins. We need some text to show off theorems with margins.

**Indented Theorem 1.** *We need some text to show off theorems with margins. We need some text to show off theorems with margins. We need some text to show off theorems with margins.*

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

This key specifies that the theorem be placed inside a `tcolorbox` environment with `\langle options \rangle`. The theorem head is typeset as a `tcolorbox` title; to avoid this see `tcolorbox-no-titlebar`<sup>→P.13</sup>.

```

% 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}
Products exist in the category of schemes over  $\mathbb{S}$ .
\end{corollary}
\begin{definition}[Dedekind domains]
A \emph{Dedekind domain} is an integrally closed, Noetherian domain of
dimension one.

```

```
\end{definition}
```

**Corollary 1.**

*Products exist in the category of schemes over  $S$ .*

**Definition 1 (Dedekind domains).**

A *Dedekind domain* is an integrally closed, Noetherian domain of dimension one.

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

Same usage as `tcolorbox`<sup>P.12</sup> 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}[Cauchy's theorem]
Let  $G$  be a finite group and  $p$  a prime dividing the order of  $G$ .
Then  $G$  contains an element of order  $p$ .
\end{boxcor}
```

**Corollary 2 (Cauchy's theorem).** *Let  $G$  be a finite group and  $p$  a prime dividing the order of  $G$ . Then  $G$  contains an element of order  $p$ .*

`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 `\NewTcbTheorem`. 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={}{},
  noteseparator={: },
  notefont=\bfseries,
```

```

    bodyfont=\normalfont,
  }
\newkeytheorem{mytheo}[
  name=Theorem,
  style=tcb-standard
]

% document
\begin{mytheo}[Quillen-Suslin]
Every finitely generated projective module over a polynomial ring is free.
\end{mytheo}

```

### Theorem 1: Quillen-Suslin

Every finitely generated projective module over a polynomial ring is free.

## 4 Theorem styles

`\newkeytheoremstyle{<name>}{<options>}`

This is keytheorems' version of thmtools' `\declaretheoremstyle`. 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 are also `\providekeytheoremstyle` and `\declarekeytheoremstyle`.

The defined style can be used with either the `style`<sup>P.9</sup> key or the traditional `\theoremstyle`.

! For the AMS classes `amsart`, `amsbook`, and `amsproc`, as well as the `amsart`-based `acmart` and `aomart`, the initial key values are slightly different than what's below in order to match those class's defaults. See [subsection 8.2](#) for details.

### 4.1 Keys also defined in 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.3</sup> can be used in `\newkeytheoremstyle`.

`bodyfont`=`<font declarations>` (initially `\itshape`)

`break` (initially unset)

Do not use this with the `postheadspace`<sup>P.15</sup> key.

`headfont`=`<font declarations>` (initially `\bfseries`)

`headformat`=`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.

! In `headformat`, you may also use the traditional `amsthm` commands `\thmname`, `\thmnumber`, and `\thmnote`, where #1 is the theorem name, #2 the number, and #3 the note. `keytheorems` expands the head spec inside `\text_expand:n` so for these commands to work properly, the package adds them to `\l_text_expand_exclude_tl`. Note also that if you use these lower-level commands, the style keys `notebraces`<sup>→P.15</sup>, `notefont`<sup>→P.15</sup>, `noteseparator`<sup>→P.15</sup>, and `numberfont`<sup>→P.15</sup> will have no effect (of course, you can manually control these things inside the commands' arguments).

`headindent`= $\langle length \rangle$  (initially 0pt)

`headpunct`= $\langle code \rangle$  (initially {.})

`notebraces`= $\{\langle left\ brace \rangle\}\{\langle right\ brace \rangle\}$  (initially  $\{\langle \rangle\}$ )

`notefont`= $\langle font\ declarations \rangle$  (initially `\fontseries\mddefault\upshape`)

`postheadspace`= $\langle skip\ expr \rangle$  (initially 5pt plus 1pt minus 1pt)

Do not use this with the `break`<sup>→P.14</sup> key.

`spaceabove`= $\langle skip\ expr \rangle$  (initially `\topsep`)

`spacebelow`= $\langle skip\ expr \rangle$  (initially `\topsep`)

! With `tcolorbox`<sup>→P.12</sup> and `tcolorbox-no-titlebar`<sup>→P.13</sup>, the `spaceabove` and `spacebelow` keys are internally passed to `tcolorbox`'s `before skip` and `after skip`. When no explicit `spaceabove` or `spacebelow` values are given, `tcolorbox` defaults are used instead of `\topsep`.

## 4.2 Keys added by `keytheorems`

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

Inherit the keys of any style declared with `\newkeytheoremstyle`<sup>→P.14</sup>. Additionally, the three styles predefined by `amsthm` are possible values: `plain`, `definition`, and `remark`.

`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 `\upshape`)

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

## 5 Restating theorems

When a theorem is given the `store`<sup>→P.5</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⟩` or `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.

`\IfRestatingTF{⟨true code⟩}{⟨false code⟩}`

`\IfRestatingT{⟨true code⟩}`

`\IfRestatingF{⟨false code⟩}`

Executes `⟨true code⟩` if being retrieved with `\getkeytheorem` and `⟨false code⟩` if in the original theorem. This is reversed if `store*` is used.

```
\begin{example}[store=hmm]
I am the \IfRestatingTF{restated}{original} example!
\end{example}

\getkeytheorem{hmm}
```

**Example 3.** *I am the original example!*

**Example 3.** *I am the restated example!*

## 5.1 Restating theorems from an external file

`\externaltheorems[⟨prefix⟩]{⟨file name⟩}`

This is `keytheorems`' version of the `xr` package's `\externaldocument`. It allows the user to restate theorems from another document's `.thlist` file. Say you have a file `mycoolpaper.tex`,

```
% mycoolpaper.tex
\documentclass{article}
\usepackage{keytheorems}
\newkeytheorem{theorem}
\begin{document}
\begin{theorem}[store=cooltheorem]
My cool theorem.
\end{theorem}
\end{document}
```



and you'd like to restate the theorem with tag `cooltheorem` in another file `myothercoolpaper.tex` with the same numbering as in the original paper. Since your new paper probably also has cool theorems that you may want to tag as `cooltheorem`, you'd like to give all restatable theorems from `mycoolpaper.tex` a prefix when retrieved with `\getkeytheorem`, say "orig:". Just call `\externaltheorems[orig:]{mycoolpaper}` after loading `keytheorems` in the new document. Then any stored theorem from `mycoolpaper.tex` can be retrieved with `\getkeytheorem{orig:<tag>}`.

```
% myothercoolpaper.tex
\documentclass{article}
\usepackage{keytheorems}
\externaltheorems[orig:]{mycoolpaper}
\newkeytheorem{theorem}
\begin{document}
\getkeytheorem{orig:cooltheorem}
\end{document}
```

It is important that the `theorem` environment is defined in both documents.

## 6 Listing theorems

`\listofkeytheorems[<options>]`

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`<sup>P.18</sup> and `indent`<sup>P.19</sup> may be necessary.

`\keytheoremset{<options>}`

```
\listofkeytheorems
```

### List of Theorems

1	Theorem . . . . .	3
2	Theorem (Bertrand's postulate) . . . . .	4
3	Theorem (Legendre's formula) . . . . .	4
4	Theorem (Bézout's identity) . . . . .	4
4*	Theorem . . . . .	5
☛	Theorem . . . . .	5
4	Theorem (continuing from p. 4) . . . . .	5
4	Theorem (Bézout's identity, continuing from p. 4) . . . . .	5
5	Theorem . . . . .	5
6	Lemma . . . . .	6
7	Theorem (Original) . . . . .	7
1	Observation . . . . .	7
2	Observation . . . . .	7
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1	Test	9
1	Example	9
1	Solution	9
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2	Proposition	10
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1	Indented Theorem	11
1	Corollary	12
1	Definition (Dedekind domains)	12
2	Corollary (Cauchy's theorem)	13
1	Theorem (Quillen-Suslin)	13
2	Example	16
3	Example	16

## 6.1 Keys also defined in thmtools

`ignore`={\langle comma-list of env names \rangle} (initially unset)

`ignoreall` (initially unset)

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

### List of Theorems

1	Theorem	3
2	Theorem (Bertrand's postulate)	4
3	Theorem (Legendre's formula)	4
4	Theorem (Bézout's identity)	4
4*	Theorem	5
☛	Theorem	5
4	Theorem (continuing from p. 4)	5
4	Theorem (Bézout's identity, continuing from p. 4)	5
5	Theorem	5
7	Theorem (Original)	7

### List of Conjectures

3.1	Conjecture	8
-----	------------	---

`numwidth`=\langle length \rangle (initially 2.3em)

For the AMS classes, this is initially 1.5pc.

`onlynamed`={\langle comma-list of env names \rangle} (initially unset)

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

`showall` (initially set)

`swapnumber=true|false` (initially false)

`title=⟨text⟩` (initially `\GetTranslation{keythms_listof_title}`)

Defaults to “List of Theorems” if English or an unknown language is used. Currently several European languages have (likely inaccurate!) translations. A translation can be added with a GitHub pull request or manually with

`\DeclareTranslation{⟨lang⟩}{keythms_listof_title}{⟨text⟩}`.

## 6.2 Keys added by `keytheorems`

`format-code=⟨code with #1, #2, and #3⟩` (initially `\numberline{#2}#1#3`)

Allows full control over the format for list entries. The theorem name is #1, the number is #2, and the (formatted) note is #3. The note formatting is still controlled by `note-code`<sup>P.20</sup>.

`indent=⟨length⟩` (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.

`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=⟨length⟩` (initially 10pt)

Controls the amount of space inserted between chunks.

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

Suppresses the printing of theorems given the `continues`<sup>P.5</sup> key in the list of theorems.

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

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 . . . . .	9
2	Example . . . . .	16
3	Example . . . . .	16
1	Solution . . . . .	9

`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.

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

Formats the optional note in the list of theorems.

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

Similar to `onlynamed`<sup>P.18</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.

`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.3</sup> load-time option.

`seq=<name>` (initially unset)

Used to list only the theorems added to the custom sequence `<name>` with the `seq`<sup>P.7</sup> theorem key. This is the only way to fully customize which theorems appear in the list of theorems. Unlike with `show`<sup>P.19</sup>, you do not need to use `ignoreall`<sup>P.18</sup> to prevent theorems not in `<name>` from being printed.

`title-code=<code with #1>` (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`.

### 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.

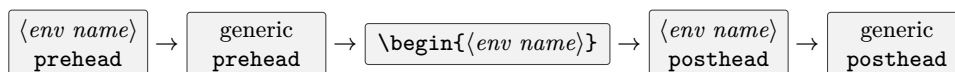
`\addtheoremcontentsline<level>{<text>}`

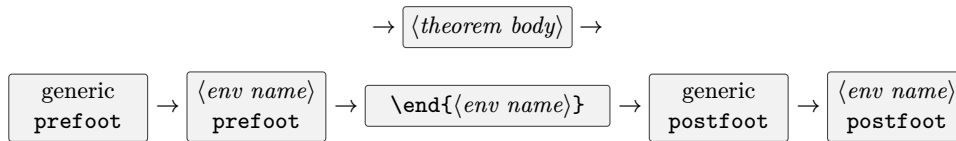
`\addtotheoremcontents{<code>}`

## 7 Theorem hooks

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

The `<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 the command `\getkeytheorem`, after 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, the `restated` hook disables the `\glossary`, `\index`, `\label`, and `\RecordProperties` commands.

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

```
\addtotheoremhook{A}
\addtotheoremhook{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  $\LaTeX$  kernel hooks that `keytheorems` uses under the hood.

Code added using the hook keys `preheadhook`<sup>P.9</sup>, etc. is outermost, meaning executed first in `prehead` and `posthead` and last in `prefoot` and `postfoot`. Furthermore, if present, the `qed`<sup>P.9</sup> symbol is placed *before* the `prefoot` hook.

## 8 Miscellaneous notes

### 8.1 beamer support

The package contains some *highly experimental* code to support theorems with `beamer`, including overlays. Most style keys are disabled by the `default` `beamer` theorem template. More become functional by setting

```
\setbeamertheorem{theorems}[ams style]
```

in the preamble. Alternatively, you have full control of theorems by setting the class option `noamsthm`.

Note that by default `beamer` defines a set of theorems when the class is loaded. These can be overwritten with `\renewkeytheorem`<sup>P.3</sup> or disabled entirely with the `notheorems` class option.

Due to complications with overlays, writing contents of theorems to the `thlist` file is disabled. This means theorems can only be restated *after* their original statement. Furthermore, `\listofkeytheorems`<sup>P.17</sup> is disabled and a warning issued if used.

User feedback is necessary to make this code fully compatible. Please report issues on the [Github page](#)!

## 8.2 Support for other classes

As mentioned in [section 4](#), the initial style key values set by `keytheorems` are adjusted for the AMS classes `amsart`, `amsbook`, and `amsproc`, the `amsart`-based `acmart` and `aomart`, and `jlreq`. You can find the exact changed values in the support files `keythms-⟨class⟩-support.tex`.

These class support files also contain code to adapt to class’ formatting of lists-of as mentioned in [section 6](#); changes are made for the AMS classes, `memoir`, `IEEEtran`, and `jlreq`.

## 8.3 Support for font packages

Some font packages, all by Michael Sharpe, offer a `theoremfont` option that redefines the `plain` style body font to have italic text with upright figures, punctuation, and delimiters. `keytheorems` detects this option and sets its initial style values accordingly. The supported packages are `baskervillef`, `cochineal`, `libertinust1math`, `newpxtext`, `newtx-text`, `scholax`, and `XCharter`.

## 8.4 Support for tagged PDF

The L<sup>A</sup>T<sub>E</sub>X team has been working hard to support the creation of tagged PDFs (see <https://latex3.github.io/tagging-project/>). The current `dev` formats make `amsthm` compatible with the kernel tagging code. Most of `keytheorems` is supported too, and anything that doesn’t work should be reported. Explicitly not supported are the `tcolorbox`<sup>→P.12</sup> and `tcolorbox-no-titlebar`<sup>→P.13</sup> keys.

To produce a tagged PDF, add `\DocumentMetadata` in the first line of your document (additional instructions are found on the [Tagging Project website](#)). An example invocation might look like

```
\DocumentMetadata
{
  lang=en-US,
  pdfversion=2.0,
  pdfstandard=ua-2,
  testphase=latest,
}
```

## 8.5 Public coding interfaces

`\l_keythms_thmuse_envname_tl`

Inside theorem environments and in all theorem hooks, you have access to the theorem’s environment and counter name in this token list variable.

`keytheorems/allthms/⟨hook name⟩`

`keytheorems/⟨envname⟩/⟨hook name⟩`

These are the “real” names for the hooks described in [section 7](#). They can be useful with `\AddToHookNext` or the kernel’s label mechanism for hooks.

## 9 Further examples

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

keytheorems-amsthmtest.tex. There is also a version for tagged PDF: tagged-  
keytheorems-amsthmtest.tex.

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