

# quick-theorems — A quick way to typeset the most common theorem-like environments\*

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## 1 Introduction

This package defines the most common theorem-like environments following the specifications from `amsthm.sty`. That is in *plain* style we define environments for

Theorem, Lemma, Corollary, Proposition, Fact, Conjecture, Criterion, Assertion.

In *definition* style we define environments for

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Definition, Acknowledgements, Condition, Problem, Open Problem, Example, Exercise, Algorithm, Question, Axiom, Property, Assumption, Hypothesis.

Finally, in *remark* style we define environments for

Remark, Note, Notation, Claim, Summary, Case, Conclusion.

## 1.1 Features to add

- add styling for theorems with names, e.g. Gauss's Lemma
- add support for Restated theorems
- (maybe) define `openproblem` with the rest of the other commands, using `\zap@space`

## 1.2 Known Bugs

- This package make use of `\MakeUppercase` for the names of the environments, it breaks `\autoref` in `\sections` etc.
- The `case` environment is usually used inside proofs. Its numbering should always restart from 1 when used. At the moment this is achieved manually with `\setcounter{thecase}{0}` before the first usage of `case`.
- the `\qed` command conflicts with the definition from `quick-math`.

## 2 Usage

This package is loaded calling `\usepackage[<options>]{quick-theorems}` in the preamble of your document. It defines the environments:

<code>theorem</code>	<code>lemma</code>	<code>corollary</code>	<code>proposition</code>	<code>fact</code>
<code>conjecture</code>	<code>criterion</code>	<code>assertion</code>	<code>definition</code>	<code>condition</code>
<code>problem</code>	<code>example</code>	<code>exercise</code>	<code>algorithm</code>	<code>question</code>
<code>axiom</code>	<code>property</code>	<code>assumption</code>	<code>hypothesis</code>	<code>remark</code>
<code>note</code>	<code>notation</code>	<code>claim</code>	<code>summary case</code>	<code>conclusion</code>
<code>openproblem</code>	<code>acknowledgements</code>			

The environments are used as usual, e.g.

```
\begin{theorem}
...an amazing theorem goes here...
\end{theorem}
```

All the environments, except `acknowledgements`, are numbered (as usual). This package builds mainly upon `amsthm.sty` and `etoolbox.sty`.

## 2.1 Styling

Through `<options>` it is straightforward to apply some common styles on the environments. The possibilities are the following.

### 2.1.1 Fonts

`small-caps` By default the plain and definition style have the environment names in **bold-face**. With the option `small-caps` they are rendered SMALLCAPS. With the option `slanted` (default option) the `proof` environment becomes “*Proof.*” and not “*Proof.*” and the body of the plain-like environments is *slanted* and not *italics*. The option `italics` reverts this behaviour.

### 2.1.2 Numbering

`swap-numbers` With this option the numbering precedes the name of the environment. The default behaviour is the opposite.

`counter=shared` This option tells if all the environments share the same counter (default) or  
`counter=not-shared` each of them has its own counter.

`follow=global` This option tells if the counter(s) should never reset (global), if they should  
`follow=chapter` reset at each chapter, section (default), subsection.  
`follow=section`  
`follow=subsection`

### 2.1.3 QED styles

This package provides some basic styling for the QED symbol redefining the command `\qedsymbol`.

<code>qed=word</code>	Q.E.D.
<code>qed=white</code>	□
<code>qed=grey</code>	■ (default)
<code>qed=black</code>	■

## 2.2 Macros

`\NewTheoremStyled` If the user needs to define some new theorem-like environment it can be done with `\NewTheoremStyled{newtheorem}{style}`. It takes 2 arguments, #1 is the theorem name (the rendered name of the newtheorem is the same name but with the first letter uppercase), #2 is the style (`definition`, `plain` or `remark`). The command `\shortproof{Very short proof}` can be used to isolate very short proofs, e.g. the previous example expands as `[[Very short proof]]`.

## 3 Implementation

```
1 <*package>
```

We load the required packages.

```
2 \RequirePackage{xcolor} % for the option ‘‘qed=grey’’
```

```

3 \RequirePackage{amsthm}
4 \RequirePackage{amssymb}
5 \RequirePackage{stmaryrd} % for the boldface brackets used in \shortproof
6 \RequirePackage{etoolbox}

We create the options for the package
7 \DeclareOption{swap-numbers}{\swapnumbers}
8 \newif\ifSmallCaps
9 \DeclareOption{small-caps}{\SmallCapstrue}
10 \newif\ifSlanted
11 \DeclareOption{slanted}{\Slantedtrue\Italicsfalse}
12 \newif\ifItalics
13 \DeclareOption{italics}{\Italicstrue\Slantedfalse}
14 \newif\ifSharedCounter
15 \DeclareOption{counter=shared}{\SharedCountertrue}
16 \DeclareOption{counter=not-shared}{\SharedCounterfalse}
17 \newif\ifGlobalCounter
18 \DeclareOption{follow=global}{\GlobalCountertrue}
19 \DeclareOption{follow=chapter}{\def\@FollowCounter{chapter}}
20 \DeclareOption{follow=section}{\def\@FollowCounter{section}}
21 \DeclareOption{follow=subsection}{\def\@FollowCounter{subsection}}
22 \newif\ifQEDWhite
23 \DeclareOption{qed=white}{\QEDWhitetrue\QEDGreyfalse\QEDBlackfalse\QEDWordfalse}
24 \newif\ifQEDGrey
25 \DeclareOption{qed=grey}{\QEDGreytrue\QEDWhitefalse\QEDBlackfalse \QEDWordfalse}
26 \newif\ifQEDBlack
27 \DeclareOption{qed=black}{\QEDBlacktrue\QEDWhitefalse\QEDGreyfalse\QEDWordfalse}
28 \newif\ifQEDWord
29 \DeclareOption{qed=word}{\QEDWordtrue\QEDWhitefalse\QEDGreyfalse\QEDBlackfalse}

We process the default options and relax.
30 \ExecuteOptions{slanted, counter=shared, follow=section, qed=grey}
31 \ProcessOptions\relax

```

### 3.1 Environment Definitions

We use the `\newtheoremstyle` commands from `amsthm.sty` to define the styles `definition`, `plain` and `remark`. We let the corresponding headfonts to be customizable via the commands `\@DefinitionHeadFont`, `\@PlainHeadFont` and `\@RemarkHeadFont`.

```

\@NewTheorem This is the main command used to define the environments.
32 \newcommand\@NewTheorem[1]{%
33   \ifGlobalCounter
34     \ifSharedCounter
35       \expandafter\newtheorem{#1}[definition]{\MakeUppercase#1}
36     \else
37       \expandafter\newtheorem{#1}{\MakeUppercase#1}
38     \fi
39   \else
40     \ifSharedCounter

```

```

41 \expandafter\newtheorem{#1}[definition]{\MakeUppercase#1}
42 \else
43 \expandafter\newtheorem{#1}{\MakeUppercase#1}[\@FollowCounter]
44 \fi
45 \fi
46 }%

```

If needed the user can define extra theorem-like environments with

`\NewTheoremStyled` It takes 2 arguments, the first is the name of the theorem and the second is the style it should use (i.e. `definition` or `plain` or `remark`). The printed name of the theorem is *the same* as the command name but the first letter is uppercase.

```

47 \newcommand{\NewTheoremStyled}[2]{%
48 \theoremstyle{#2}
49 \@NewTheorem{#1}
50 }%

```

### 3.1.1 Definition-like Environments

`\@DefinitionHeadFont`

```

51 \newcommand{\@DefinitionHeadFont}{\ifSmallCaps\scshape\else\bfseries\fi}

```

`definition`

```

52 \newtheoremstyle{definition}
53 {\topsep} % ABovespace
54 {\topsep} % BELOWSpace
55 {\normalfont} % BODYFont
56 {0pt} % INDENT (empty value is the same as 0pt)
57 {\@DefinitionHeadFont} % HEADFont
58 {.} % HEADPUNCT
59 {5pt plus 1pt minus 1pt} % HEADSpace
60 {} % CUSTOM-HEAD-SPEC
61 %
62 \theoremstyle{definition}

```

The environments `definition`, `acknowledgements` and `openproblem` are defined by hand below. We start with `definition`.

```

63 \ifGlobalCounter
64 \newtheorem{definition}{Definition}
65 \else
66 \newtheorem{definition}{Definition}[\@FollowCounter]
67 \fi

```

Then we define `acknowledgements`. (It is defined separately as it is never numbered.)

```

68 \newtheorem*{acknowledgements}{Acknowledgements}

```

Then we define `openproblem`. (It is defined separately as “Open Problem” are two words.)

```

69 \ifGlobalCounter

```

```

70 \ifSharedCounter
71   \newtheorem{openproblem}[definition]{Open Problem}
72 \else
73   \newtheorem{openproblem}{Open Problem}
74 \fi
75 \else
76 \ifSharedCounter
77   \newtheorem{openproblem}[definition]{Open Problem}
78 \else
79   \newtheorem{openproblem}{Open Problem}[\@FollowCounter]
80 \fi
81 \fi

```

We now define all the other environments using the definition style.

```

82 \forcsvlist{\listadd\@DefinitionList}{condition, problem, example, %
83 exercise, algorithm, question, axiom, property, assumption, hypothesis}
84 \forlistloop\@NewTheorem{\@DefinitionList}

```

### 3.1.2 Plain-like Environments

\@PlainHeadFont

```

85 \newcommand{\@PlainHeadFont}{\ifSmallCaps\scshape\else\bfseries\fi}

```

\@PlainBodyFont

```

86 \newcommand{\@PlainBodyFont}{\ifSlanted\slshape\fi\ifItalics\itshape\fi}

```

plain

```

87 \newtheoremstyle{plain}
88   {\topsep}    % ABovesPACE
89   {\topsep}    % BELOWSpace
90   {\@PlainBodyFont} % BODYFont
91   {0pt}        % INDENT (empty value is the same as 0pt)
92   {\@PlainHeadFont} % HEADFont
93   {.}          % HEADPUNCT
94   {5pt plus 1pt minus 1pt} % HEADSPACE
95   {}           % CUSTOM-HEAD-SPEC

96 \theoremstyle{plain}
97 %
98 \forcsvlist{\listadd\@PlainList}{theorem, lemma, corollary, proposition, %
99 fact, conjecture, criterion, assertion}
100 \forlistloop\@NewTheorem{\@PlainList}

```

### 3.1.3 Remark-like Environments

\@RemarkHeadFont

```

101 \newcommand{\@RemarkHeadFont}{\ifSlanted\slshape\fi\ifItalics\itshape\fi}

```

remark

```

102 \newtheoremstyle{remark}
103   {0.5\topsep}   % ABovesPACE
104   {0.5\topsep}   % BELOWSpace
105   {\normalfont}  % BODYFont
106   {0pt}          % INDENT (empty value is the same as 0pt)
107   {\@RemarkHeadFont} % HEADFont
108   {.}            % HEADPUNCT
109   {5pt plus 1pt minus 1pt} % HEADSPACE
110   {}             % CUSTOM-HEAD-SPEC

111 \theoremstyle{remark}
112 %
113 \forcsvlist{\listadd\@RemarkList}{remark, note, notation, claim, %
114 summary, case, conclusion}
115 \forlistloop\@NewTheorem{\@RemarkList}

```

## 3.2 Proof macros

If the `slanted` option is active we redefine `\proofname`

```

116 \ifSlanted
117   \let\oldproofname=\proofname
118   \renewcommand{\proofname}{\slshape\oldproofname}
119 \fi

```

`\shortproof` We provide a command to isolate very short proofs.

```

120 \newcommand{\shortproof}[1]{\llbracket\scriptsize#1\rrbracket}

```

`\qedsymbol` Finally, we process the options relative to QED and redefine `\qedsymbol` accordingly.

```

121 \renewcommand{\qedsymbol}{%
122   \ifQEDWhite {\scriptsize\square} \fi
123   \ifQEDGrey {\scriptsize\textcolor{black!50!white}{\blacksquare}} \fi
124   \ifQEDBlack {\scriptsize\blacksquare} \fi
125   \ifQEDWord {\scshape q.e.d.} \fi
126 }%
127 %
128 \endinput
129 \</package>

```