

The `setbuilder` package

Smart set-builder notation
with correctly scaled braces and separator

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<https://github.com/vssekorin/setbuilder>

1 Introduction

Typesetting set-builder notation correctly in $\text{\LaTeX}$ requires a number of manual adjustments. The naive markup

$$\{\,x \mid x > 0\,\}$$

already carries two thin spaces inserted by hand, and it still breaks down as soon as the contents grow: the braces stay small. The robust alternative,

$$\left\{\,x \,\middle|\, x > 0\,\right\}$$

scales the braces, but now four occurrences of `\,` are needed, and they obscure the structure of the formula. In a subscript the same spaces are too wide and have to be removed again by hand.

The `setbuilder` package reduces all of this to one command:

$$\set{x \in \mathbb{R} \given x^2 < 2} \qquad \{x \in \mathbb{R} \mid x^2 < 2\}$$

with correct spacing around the separator, automatic or fixed scaling of *both* the braces and the bar, spaces that vanish in sub- and superscripts, and a permitted line break after the bar in inline formulas.

2 Usage

`\usepackage{setbuilder}`

2.1 The `\set` command

$$\set{1, 2, 3, \dots} \qquad \{1, 2, 3, \dots\}$$
$$\set{x \in \mathbb{R} \given x^2 < 2} \qquad \{x \in \mathbb{R} \mid x^2 < 2\}$$

The separator is written `\given` (or its synonym `\suchthat`). Both raise a descriptive error when used outside `\set`.

Note the difference between the two examples above: the second one is padded with a thin space just inside the braces, the first one is not. Knuth (*The $\text{\TeX}$ book*) prescribes the space for a set given by a

condition, $\{x \mid x > 0\}$, but not for a plain enumeration, $\{1, 2, \dots, n\}$. Since `\set` serves both, it inserts the space only when the body contains a separator. The amount is the `pad` option (see below).

2.2 Auto-scaling: `\set*`

The starred form wraps the contents in `\left...\middle...\right`, so the braces *and* the bar grow together:

$$\text{\set*{\frac{n}{n+1} \given n \in \mathbb{N}}}$$

$$\left\{ \frac{n}{n+1} \mid n \in \mathbb{N} \right\}$$

$$\text{\set*{A \subseteq \mathbb{N} \given \sum_{a \in A} \frac{1}{a} < \infty}}$$

$$\left\{ A \subseteq \mathbb{N} \mid \sum_{a \in A} \frac{1}{a} < \infty \right\}$$

2.3 Fixed size: `\set[\Big]`

When auto-scaling overshoots, a well-known limitation of `\left...\right`, the size can be fixed explicitly:

$$\text{\set[\Big]{x \given f(x) = \max_y f(y)}}$$

$$\left\{ x \mid f(x) = \max_y f(y) \right\}$$

2.4 Correct spacing in scripts

The thin spaces around the separator are inserted with `\nonscript\:`, so they disappear in sub- and superscripts, where they would be disproportionately wide:

$$\bigcup_{i \in \{n \mid n \geq 1\}} A_i \quad \text{compare hand-made:} \quad \bigcup_{i \in \{n \mid n \geq 1\}} A_i$$

2.5 Nesting

$$\text{\set*{\set{x \given x \sim y} \given y \in Y}}$$

$$\{ \{ x \mid x \sim y \} \mid y \in Y \}$$

3 Package options

Options use the key–value syntax of the modern L^AT_EX kernel.

bar (default) The separator is a vertical bar: $\{x \mid x > 0\}$.

colon The separator is a colon throughout the document, as preferred in some traditions: $\{x : x > 0\}$.

pad=<mu glue> The space inserted just inside the braces of a set given by a condition. The default is `\`, (that is, `3mu`); `pad=none` disables it, so that the body abuts the braces: $\{x \mid x > 0\}$. Any `mu glue` is accepted, e.g. `pad=2mu plus 1mu`. The option has no effect on a set written as an enumeration, which is never padded.

synonym=<name> Additionally defines `\<name>` as a full copy of `\set`, including the starred and fixed-size variants. This document, for instance, is compiled with `synonym=Setb`:

$$\text{\Setb*{\frac{1}{n} \given n \geq 1}}$$

$$\left\{ \frac{1}{n} \mid n \geq 1 \right\}$$

3.1 Conflict with an existing `\set`

Some packages define their own `\set`. In that case `setbuilder` never overwrites the existing command. Instead:

- if a synonym was requested, the synonym silently becomes the way to access the functionality:
`\usepackage[synonym=mkset]{setbuilder}`
- if no synonym was requested, the package issues a warning with exactly this advice, and the document still compiles.

Requesting a synonym whose name is itself already defined (`synonym=section`) produces an explicit error message.

4 Requirements

The package loads `mathtools` and requires a L^AT_EX kernel from 2022-06-01 or newer (for key–value package options and `\NewCommandCopy`).

5 Implementation notes

The command is built with `\DeclarePairedDelimiterX` from `mathtools`, which provides the plain, starred and sized variants uniformly. Inside the delimiter body, `\given` is redefined locally to typeset the separator at the current delimiter size (`\delimsize`). The separator itself is

`\nonscript\:<bar>\allowbreak\nonscript\:<mathopen{}`

where the trailing `\mathopen{}` makes a following unary minus space correctly, and `\allowbreak` permits a line break after the bar in inline material.

The padding is emitted only if `\in@` finds `\given` or `\suchthat` in the body at brace level 0. The test is run twice, once before and once after the body, rather than cached in a flag: a nested `\set` inside the body would overwrite `\ifin@` in between. Like the spaces around the separator, the padding is prefixed with `\nonscript`, so it disappears in scripts.

6 Changes

v0.2.0 (2026-07-28) New `pad` option: a thin space inside the braces for sets given by a condition, none for enumerations.

v0.1.1 (2026-07-25) Bug fix: `\given` and `\suchthat` are now robust, so they survive expansion in moving arguments (section titles, captions) unbroken.

v0.1.0 (2026-07-19) First public version.