

The `mathformule` Package

A Lightweight Environment for Single- and Multiline Mathematics

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Abstract

The `mathformule` package provides the numbered `formule` display environment for both single-line and aligned multiline mathematics. A multiline display may have one overall equation number or a separate configurable subnumber on each row. An extensible brace may surround all rows on either side, and both row separation and brace spacing can be adjusted. The package does not explicitly require or load an auxiliary package; its typesetting core is implemented with $\text{T}_{\text{E}}\text{X}$ primitives and $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ kernel facilities. It shares $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$'s standard equation counter and works with the usual numbering and cross-reference mechanisms. Version 0.6 has been verified with $\text{pdfL}^{\text{A}}\text{T}_{\text{E}}\text{X}$, $\text{XeL}^{\text{A}}\text{T}_{\text{E}}\text{X}$, and $\text{LuaL}^{\text{A}}\text{T}_{\text{E}}\text{X}$.

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1 Overview

Engines. This is a package for current L^AT_EX 2_ε formats. Version 0.6 has been verified with pdfL^AT_EX, XeL^AT_EX, and LuaL^AT_EX. It is not a plain T_EX macro file, and other engines or formats are outside the currently verified scope.

The same `formule` environment is intended for a short single formula and for a system of multiline formulas. Rows without an ampersand share a left edge; an ampersand requests explicit column alignment, and a double backslash ends a row. By default all rows share one equation number. Optional keys provide left or right braces, signed spacing corrections, and per-row subnumbers.

The package does not explicitly load `amsmath` or another auxiliary package, and it does not wrap `equation`, `align`, or `aligned`. It can nevertheless be used in documents that load the AMS mathematics packages and common reference packages such as `hyperref` and `cleveref`. It follows the document-wide `leqno` and `fleqn` conventions when they are active.

2 Installation and loading

For a local installation, place `mathformule.sty` in the document directory and write:

```
\usepackage{mathformule}
```

For equation numbers tied to a document division, use one of the package options below. The `chapter` option requires a class that defines a `chapter` counter.

```
\usepackage[section]{mathformule}
% or
\usepackage[chapter]{mathformule}
```

The more general preamble command accepts any existing L^AT_EX counter:

```
\mathformulenumberswithin{subsection}
```

This setting deliberately changes the shared `equation` counter, so native equations and `formule` displays retain a single numbering scheme.

3 Basic displays

3.1 A single formula

The simplest use is equivalent in purpose to a numbered display equation:

```
\begin{formule}\label{eq:energy}
  E=mc^2
\end{formule}
```

The contents are already in display math mode; dollar signs must not be added.

3.2 Multiline rows and alignment

If the environment contains no top-level `&`, all rows occupy one left-aligned formula column. Formulas of different widths therefore share their left edge:

```
\begin{formule}
  f(x)=a+b \\
  abc=cd
\end{formule}
```

Once a top-level `&` is present, columns before an alignment point are right aligned and columns after it are left aligned. Use `\\` for a row break:

```
\begin{formule}\label{eq:identities}
  (a+b)^2 &= a^2+2ab+b^2 \\
  (a-b)^2 &= a^2-2ab+b^2 \\
  (a+b)(a-b) &= a^2-b^2
\end{formule}
```

All three rows receive one overall number. A final `\\` is optional; if supplied, it is ignored and creates neither an empty row nor an additional number. A leading ampersand is valid: it leaves the first column empty and places the formula in the left-aligned second column. For example:

```
\begin{formule}[multnum={arabic-roman},lbrace,lineskip=0pt]
  &f(x)=a+b \\
  &abc=cd
\end{formule}
```

Several alignment pairs may be placed on one row:

```
\begin{formule}
  a_1 &= b_1 & c_1 &= d_1 \\
  a_2 &= b_2 & c_2 &= d_2
\end{formule}
```

Only top-level ampersands select this alignment behaviour. Ampersands inside a braced argument or a nested environment such as `array` do not alter the outer `formule` alignment. For predictable columns, use explicit ampersands consistently throughout one environment.

4 Row separation

The default multiline setting opens the normal formula-row baseline distance by `3pt`. All spacing values described here are signed corrections to that default, not absolute baseline distances.

4.1 Document-wide correction

Use `\formuleskip` in the preamble to modify all multiline `formule` environments. Positive values loosen the rows and negative values tighten them.

```
\formuleskip{1pt}    % add 1pt to the default in every formule
% \formuleskip{-1pt} would subtract 1pt
```

The command expects a TeX dimension. It has no visible effect on a single-line display because such a display has no inter-row separation.

4.2 Correction for one environment

The `lineskip` key replaces the global `\formuleskip` correction for that environment:

```
\formuleskip{1pt}

\begin{formule}[lineskip=-2pt]
  a &= b \\\
  c &= d
\end{formule}
```

Here the local correction is `-2pt`; it is not added to the global `1pt` correction.

The prototype shorthand `[dimen]` remains accepted and has the same meaning and precedence as `[lineskip=dimen]`. The explicit key form is recommended for new documents.

4.3 Correction after one row

An optional dimension after a row break applies an additional local vertical adjustment after that row only:

```
\begin{formule}
  a &= b \\[2pt]
  c &= d \\[ -1pt]
  e &= f
\end{formule}
```

The vertical space outside the complete display is not controlled by these interfaces. It remains the class-defined rubber display space based on:

```
\abovedisplayskip      \abovedisplayshortskip
\belowdisplayskip      \belowdisplayshortskip
```

5 Braces around a multiline display

5.1 Left and right braces

The bare `lbrace` and `rbrace` keys place an extensible brace around the complete group of rows:

```
\begin{formule}[lbrace]
  x+y &= 3 \\\
  x-y &= 1
\end{formule}
```

```
\begin{formule}[rbrace]
  p &= q \\\
  r &= s
\end{formule}
```

The brace is produced by TeX's standard extensible math-delimiter mechanism, the same mechanism used by `\left\{` and `\right\}`. The two brace keys are mutually exclusive.

5.2 Material outside the brace

A key value is placed in display math mode before a left brace or after a right brace:

```
\begin{formule}[lbrace={f(x)=}]
  x^2, & x\geq 0 \\
  -x,   & x<0
\end{formule}
```

```
\begin{formule}[rbrace={G(t)}]
  p(t) &= t^2+1 \\
  q(t) &= 2t-3
\end{formule}
```

No relation symbol or spacing is inserted automatically. Braces around the value are recommended when it contains a comma or an equals sign.

5.3 Brace-spacing corrections

`lbraceskip` and `rbraceskip` apply signed horizontal corrections between the selected brace and the aligned rows:

```
\begin{formule}[lbrace={F(x)=},lbraceskip=2pt]
  a &= b \\
  c &= d
\end{formule}
```

```
\begin{formule}[rbrace={S},rbraceskip=-1pt]
  u+v &= 7 \\
  2u-v &= 5
\end{formule}
```

A brace-spacing key has no output effect unless its matching brace is active.

6 Equation numbers and references

6.1 The standard equation sequence

Every `formule` display advances L^AT_EX's standard `equation` counter once. Consequently native `equation` displays and `formule` displays interleave without a separate sequence. Existing definitions of `\theequation` are retained unless the user requests division-based numbering through this package.

For an overall number, place `\label` in the environment and use the ordinary reference commands:

```
\begin{formule}\label{eq:sum}
  \sum_{k=1}^n k = \frac{n(n+1)}{2}
\end{formule}
```

See `equation~\ref{eq:sum}`.

When their packages are loaded, `\eqref`, `\autoref`, and `\cref` use the same stored number and hyperlink target.

With the document-wide `leqno` setting, overall and per-row tags follow the class's left-numbering convention. With `fleqn`, the formulas use the class's display-math indentation.

6.2 One subnumber per row

For a genuinely multiline display, the bare `multnum` key changes one overall tag into a tag on each numbered row:

```
\begin{formule}[multnum]
  x+y &= 8 \label{eq:system-a} \\
  x-y &= 2 \label{eq:system-b} \\
\end{formule}
```

If the main equation number is 3, these rows are numbered 3.1 and 3.2. The complete group consumes only main number 3; the next standard equation is 4. A `\label` for a row should be placed on that numbered row.

The four explicit styles are:

Key value	First two tags	Second component
<code>arabic.arabic</code>	3.1, 3.2	Arabic
<code>arabic-arabic</code>	3-1, 3-2	Arabic
<code>arabic.roman</code>	3.i, 3.ii	lower-case Roman
<code>arabic-roman</code>	3-i, 3-ii	lower-case Roman

The aliases `arabic` and `roman` are accepted for `arabic.arabic` and `arabic.roman`, respectively.

For example:

```
\begin{formule}[multnum={arabic-roman}]
  a &= b \label{eq:roman-a} \\
  c &= d \label{eq:roman-b} \\
\end{formule}
```

The first component is always the complete current main equation number. If equations are numbered by section, main number 2.3 therefore gives row numbers 2.3-i and 2.3-ii. A single-row display ignores `multnum` and uses the ordinary overall equation number.

6.3 Suppressing individual row numbers

In `multnum` mode, `\notag` and `\nonumber` suppress the tag on one row. A suppressed row does not consume a subnumber.

```
\begin{formule}[multnum={arabic.roman}]
  a_1 &= b_1 \label{eq:first} \\
  a_2 &= b_2 \notag \\
  a_3 &= b_3 \nonumber \\
  a_4 &= b_4 \label{eq:second} \\
\end{formule}
```

Do not attach a label to a suppressed row, because that row intentionally has no independent reference target.

7 Combined example

The following example combines a left brace, material before the brace, global and local row spacing, Roman row subnumbers, a brace-spacing correction, row-number suppression, references, and a harmless final row break.

```
\usepackage[section]{mathformule}
\formuleskip{1pt}

\begin{formule}[
  lbrace={F(x)=},
  lbraceskip=1pt,
  lineskip=-1pt,
  multnum={arabic-roman}]
  x^2, & x>0 \label{eq:case-positive} \\
  0,   & x=0 \notag \\
  -x,  & x<0 \label{eq:case-negative} \\
\end{formule}
```

See `\ref{eq:case-positive}` and `\ref{eq:case-negative}`.

In `multnum` mode, at most four alignment pairs (eight formula columns) are supported on each row.

8 Option summary

Interface	Meaning
<code>\formuleskip{dimen}</code>	Global signed correction to multiline row separation.
<code>lineskip=dimen</code>	Local signed correction; replaces <code>\formuleskip</code> for one environment.
<code>[dimen]</code>	Prototype shorthand for <code>[lineskip=dimen]</code> .
<code>\\[dimen]</code>	Additional correction after one row.
<code>lbrace, rbrace</code>	Extensible brace around all rows.
<code>lbrace={math}</code>	Math material before a left brace.
<code>rbrace={math}</code>	Math material after a right brace.
<code>lbraceskip=dimen</code>	Signed left-brace spacing correction.
<code>rbraceskip=dimen</code>	Signed right-brace spacing correction.
<code>multnum</code>	Arabic row subnumbers separated by a dot.
<code>multnum={style}</code>	Explicit row-number style.
<code>\notag, \nonumber</code>	Suppress one row tag in multiline <code>multnum</code> mode.

9 Compatibility and limitations

The package does not explicitly require or load a supporting package; its typesetting core uses $\TeX$ primitives and $\LaTeX$ kernel facilities. It has been tested with pdf $\LaTeX$, Xe $\LaTeX$, and Lua $\LaTeX$, as well as with commonly used AMS mathematics packages and cross-reference packages. These supporting packages are optional. No conflict is currently known from the tested combinations, but behaviour in an arbitrary document can still depend on the document class, package versions, and loading order.

An `formule` environment must be used in text mode and cannot be nested inside another mathematics environment. The keys `lbrace` and `rbrace` cannot be combined. In `multnum`

mode the current limit is four alignment pairs per row. The package refuses to overwrite a pre-existing environment named `formule` and reports a package error instead.

10 Development, acknowledgements, and license

The design was informed by established L^AT_EX display-math conventions and by the user interfaces of environments such as `equation`, `align`, and `aligned`. The implementation is independently structured around T_EX primitives and L^AT_EX kernel facilities. It uses established public T_EX programming idioms for safe alignment and delimiter handling; it neither wraps nor reproduces an existing display environment as its implementation. Thanks are due to the T_EX and L^AT_EX communities whose documented conventions made compatible behaviour possible.

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