



1. a list of characters, like `abc` or `\partial` or  $\mathbb{R}$ ;
2. a character range, like ``A-`Z`, 65–90 or `"41-"5A`;
3. one of the alphabets `[Ll]atin`, `[Gg]reek`, or `digits`;
4. one of the style groups `bold`, `boldgreek`, `sans`, `sansgreek`, `mono`, `blackboard`, `fraktur` or `script`;
5. the name of a math class: `ord`, `op`, `bin`, `rel`, `fence`, `open`, `close` or `punct`.

Note that unicode is somewhat irregular in its encoding of mathematical letters; this is taken into account when using ranges as under (2) above. Thus, `\mscra-`mscrz` really gives you all lowercase script characters, despite e.g. *e* being well outside that range.

The default style settings are `\mathmap {latin, greek, Latin}{it}`. Since the math family setting is not used anymore for selecting different styles, the default family of every symbol is zero. Instead, you can use `\mathfam` for mixing fonts (see below). The `class` option to `\mathclass` should be one of the names under 5.

## Character variants

You can change the default appearance of several greek characters with `\usemathvariant {chars}` or `\usemathdefault {chars}`, where `chars` is a list of normal greek characters. As in unicode but against tex's tradition, the variants are  $\epsilon\vartheta\Theta\varpi\varrho\phi$  and the defaults  $\varepsilon\theta\Theta\kappa\pi\rho\varphi$ . The macros `\varepsilonpsilon` etc. have been updated to reflect the unicode variants.

The appearance of root symbols can be set with `\closedroots` ( $\sqrt{2}$ ) and `\normalroots` ( $\sqrt[2]{2}$ , the default).

Say `\unicodedots` to use the unicode dots characters ( $\cdots$ ,  $\cdotp$ ) and `\traditionaldots` to construct these characters from periods ( $\cdots$ ,  $\cdotp$ , the default). Both settings affect the meaning of both the actual characters and the `\xdots` macros ( $x \in \{l, v, c, a, d\}$ ). Unlike in traditional plain tex, the traditional dots are available in script sizes, too.

Say `\decimalcomma` and have commas appear as 1,2 instead of 1.2 (`\nodecimalcomma` restores the default). The explicit `\comma`, like `\colon`, will always be punctuation.

The behaviour of limits on integral signs can be set by redefining `\intllimits` (the default is `\let \intllimits = \nolimits`).

If you want to change the meaning (inside math mode) altogether for a single character, you can use the commands `\mathdef` and `\mathlet`. For example, by default, you can use the letter *h* for the reduced planck constant  $\hbar$ ; this has been made so with `\mathdef h {\hbar}` (you could also have said `\mathlet h \hbar`).

## Setting up fonts

The minimum you need to do to set up a mathematical font is this:

```
\font\tenmath
    {Latin Modern Math:mode=base;script=math;ssty=0} at 10pt
\font\tenmaths
    {Latin Modern Math:mode=base;script=math;ssty=1} at 7pt
\font\tenmathss
    {Latin Modern Math:mode=base;script=math;ssty=2} at 5pt
\textfont      0 = \tenmath
\scriptfont    0 = \tenmaths
\scriptscriptfont 0 = \tenmathss
```

Note that you only have to set up the font for a single family: opentype mathematical fonts typically contain all necessary variants of all mathematical characters. Therefore, the `\fam` setting has been made a no-op (use `\setfam` if you really need the old primitive) and the default family of all symbols has been set to zero.

As mentioned above, you can still change the family number of specific characters and this allows you to mix mathematical fonts. For instance, if you dislike the current blackboard bold characters, just assign a second font to family 1 and say `\mathfam {blackboard} 1`. Less useful are the parameters `\accentfam`, `\radicalfam` and `\extensiblefam` that control the family of all accents, radicals and extensibles.

## Shorthands and additions

You can use `\text` for adding nonmathematical text to your equations. It will behave well in sub- and superscripts: `\text{word}^{\text{word}}` gives  $\text{word}^{\text{word}}$ . By default, the font used is the normal mathematical font. You can change this by setting the `\textfam` parameter to some nonzero value and assigning a different font to that family (see above). You probably want to do this, since most commonly-used mathematical fonts do not include a normal kerning table.

All the usual arrows can be made extensible by prefacing them with an `x`, including `\xmapsto` and `\xmapsfrom`. Alternatively, you can use `\rightarrow` etc. as shorthands. Additionally, you can use the following:

Shorthand	Result
<code>\bra x, \ket y</code>	$\langle x ,  y\rangle$
<code>\braket x y</code>	$\langle x y\rangle$
<code>\norm x, \Norm x</code>	$ x , \ x\ $
<code>x \stackrel{?}{=} y</code>	$x \stackrel{?}{=} y$
<code>x \stackbin{a}{+} y</code>	$x \stackbin{a}{+} y$
<code>f\inv</code>	$f^{-1}$ (cf. $f^{-1}$ )
<code>a \xrightarrow[down]{up} b</code>	$a \xrightarrow[down]{up} b$
<code>a \xrightarrow[down]{up} b</code>	$a \xrightarrow[down]{up} b$
<code>\frac12, \tfrac12, \dfrac12</code>	$\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

Also new are the operators `\Tr`, `\tr`, `\Span`, `\GL`, `\SL`, `\SU`, `\U`, `\SO`, `\O`, `\Sp`, `\im`, `\End`, `\Aut`, `\Dom` and `\Codom`. You can define new operators with `\newmathop` and `\newlargethmathop`: `\newmathop{op}` will define the new operator `\op`. For single use of an upright symbol, operator or large operator you can use `\mord`, `\mop` and `\mlop`. The difference between `\mord` and `\mup` is that `\mord` also applies the correct symbol spacing.

The accents `\overbrace`, `\underbracket` etc. allow a label between square brackets: `$$\underbrace{[=1]}{(x^2+y^2)}$$` gives

$$\underbrace{(x^2 + y^2)}_{=1}.$$

## Best practices

The following remarks on mathematical typesetting have no relation to the contents of this package; I have included them because I find them hard to remember.

1. `\eqalign` gives a vertically centered box and can occur many times in an equation, while `\eqalignno` and `\leqalignno` span whole lines (put the equation numbers in the third column). All assume the relation (or operator) appears at the right hand side of the ampersand.
2. The command `\displaylines` can only have one column that spans the whole line (and you will have to add the equation number by hand).
3. Further alignment commands are `\cases`, `\matrix`, `\pmatrix` (with parentheses) and `\bordermatrix` (includes labels for lines and columns).
4. Finetuning alignments can be done with `\smash`, `\phantom`, `\hphantom` and `\vphantom`.
5. Small matrices like  $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$  can be made by misusing `\choose` or `\atop`.
6. If you start a line with a binary operator, put a `{}` before it: this way, tex recognises it as such.
7. Thin spaces (`\,`) should be inserted: before  $dx$ , before units, after factorials and after `\dots` if those are followed by a closing parenthesis.
8. Whether the differential operator should be set upright or not is as of yet an open question in mathematics.
9. You should prefer `\bigr` and `\bigl` etc. over `\big`, `\Big`, `\bigg` and `\Bigg`.
10. An overview of mathematical symbols, with control sequences and their availability in different fonts, can be found in `unimath-symbols.pdf`, which is part of the unicode-math package.

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