A new implementation of LaTeX math*

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1 Introduction

This is a reimplementation of LaTeX and AMSLaTeX math using the new math font encodings proposed in [?]. It reimplements almost all macros from `fontmath.ltx`, `amsfonts.sty` and `amssymb.sty`. It also implements nestable and under accents, an arrow kit (see [?]) and many new symbols.

The basic macros for the new math setup are in the file `fontmath.cfg` which can be used to produce a latex format with the new math setup built in. Simply put it in your TeX search path and do (assuming a Web2c 7.0-based TeX installation)

`tex -ini latex.ltx`

The packages `newmath` and `oldmath` will work regardless of the math setup built in the format. `oldmath` reverts to the old math setup if the format contains the new setup, `newmath` loads the new setup, if it is not already loaded.

If you want to try the new math setup with your own files, you should know about the options which are recognized by `newmath`:

`amssymb` provides replacements for all definitions in in the packages `amssymb` and `amsfonts`, using two extra math families. You can expect an almost fully functional AMSLaTeX math setup if you say

```
\usepackage[amssymb]{newmath}
\usepackage{amsmath}
```

One thing that will fail with `amsmath` v1.2d is the `\sqrt` macro. Hopefully a newer version of `amsmath` will correct this.

`extraops` provides access to the new big operators and delimiters in the MX1 encoding, using up to two extra math families (the basic size delimiters are in the MS2 encoding, so it will also be loaded, if you haven't given the `amssymb` option anyway).

`textcomp` provides some glyphs which are no longer in the math encodings but can be found in the TC fonts. This is done via `amstext` and *without* using an extra math family.

*This file is part of the mathfont package v0.59 , dated 1998/04/20.

`manysizes` provides more sizes of delimiters and accents.

`noexscale` can be used with the `cm`, `concrete` or `euler` layouts to revert to the traditional setup of loading the extensible fonts in only one size.

The default behaviour of `newmath` is to load three sizes and to change the sizes with the text font size. In the old math setup, this functionality was provided by the package `exscale`.

`accents` provides nestable and under accents.

`euler` changes to the Euler layout.

`concrete` changes to the concrete layout.

`mathptm` changes to the mathptm layout.

`mathematica` changes to the Mathematica layout.

`lucida` changes to the Lucida layout with the Lucida New Math fontset.

`lucidexp` changes to the Lucida layout with the Lucida Expert fontset.

`mathtime` changes to the MathTime layout.

`mathplus` changes to the MathTime Plus layout.

The Lucida layout has some additional options influencing the set of fonts which will be loaded:

`noscale` makes the Lucida layout use unscaled fonts.

`smallscale` makes the Lucida layout use smaller scaled fonts.

`altitalic` makes the Lucida layout use an alternate italic alphabet.

`upitalic` makes the Lucida layout use an 'upright italic' alphabet.

The `newmath` package also recognizes the options `mathitalic1`, `mathitalic2` and `mathitalic3` for selecting the default, alternate or upright italic alphabet of the Lucida layout.

So `\usepackage{newmath}` uses 4 families, `\usepackage[amssymb]{newmath}` uses 6 families and `\usepackage[amssymb,extraops]{newmath}` uses 7 families and adding the `textcomp`, `manysizes`, `accents`, `noexscale` or a layout option does not change family consumption.

2 Command summary

In this section we present all symbols which are available in the new math setup classified by their `\mathclass`.

Table 1: Math alphabets

$ABab01$	`\mathnormal{ABab01}`	$\mathcal{AB}$	`\mathcal{ABab01}`
ABab01	`\mathrm{ABab01}`	**ABab01**	`\mathbf{ABab01}`
ABab01	`\mathit{ABab01}`	$\mathsf{ABab01}$	`\mathsf{ABab01}`
`ABab01`	`\mathtt{ABab01}`		

Table 2: Accents

$\grave{a}$	`\grave{a}`	$\acute{a}$	`\acute{a}`	$\hat{a}$	`\hat{a}`	$\tilde{a}$	`\tilde{a}`
$\ddot{a}$	`\ddot{a}`	$\hat{a}$	`\arc{a}`	$\mathring{a}$	`\ring{a}`	$\check{a}$	`\check{a}`
$\breve{a}$	`\breve{a}`	$\bar{a}$	`\bar{a}`	$\dot{a}$	`\dot{a}`	$\dddot{a}$	`\dddot{a}`
$\vec{a}$	`\vec{a}`	$\overleftarrow{a}$	`\rvec{a}`	$\overleftrightarrow{a}$	`\dvec{a}`	$\overline{a}$	`\upbrack{a}`
$\overline{a}$	`\downbrack{a}`	$\dot{\bar{a}}$	`\bardot{a}`	$\bar{\dot{a}}$	`\dotbar{a}`	$\ddot{\bar{a}}$	`\barddot{a}`
$\bar{\ddot{a}}$	`\ddotbar{a}`	$\tilde{\hat{a}}$	`\hattilde{a}`	$\bar{\hat{a}}$	`\hatbar{a}`	$\bar{\bar{a}}$	`\doublebar{a}`
$\acute{a}$	`\graveinv{a}`	$\grave{a}$	`\acuteinv{a}`				

Table 3: Upright greek

α	`\alphaup`	β	`\betaup`	γ	`\gammaup`	δ	`\deltaup`
ϵ	`\epsilonup`	ε	`\varepsilonup`	ζ	`\zetaup`	η	`\etaup`
θ	`\thetaup`	ϑ	`\varthetaup`	ι	`\iotaup`	κ	`\kappaup`
ϰ	`\varkappaup`	λ	`\lambdaup`	μ	`\muup`	ν	`\nuup`
ξ	`\xiup`	ο	`\omikronup`	π	`\piup`	ϖ	`\varpiup`
ρ	`\rhoup`	ϱ	`\varrhoup`	σ	`\sigmaup`	ς	`\varsigmaup`
τ	`\tauup`	υ	`\upsilonup`	ϕ	`\phiup`	φ	`\varphiup`
χ	`\chiup`	ψ	`\psiup`	ω	`\omegaup`		
Α	`\Alphaup`	Β	`\Betaup`	Γ	`\Gammaup`	Δ	`\Deltaup`
Ε	`\Epsilonup`	Ζ	`\Zetaup`	Η	`\Etaup`	Θ	`\Thetaup`
Ι	`\Iotaup`	Κ	`\Kappaup`	Λ	`\Lambdaup`	Μ	`\Muup`
Ν	`\Nuup`	Ξ	`\Xiup`	Ο	`\Omikronup`	Π	`\Piup`
Ρ	`\Rhoup`	Σ	`\Sigmaup`	Τ	`\Tauup`	ϒ	`\Upsilonup`
Υ	`\varUpsilonup`	Φ	`\Phiup`	Χ	`\Chiup`	$\mathcal{X}$	`\varChiup`
Ψ	`\Psiup`	Ω	`\Omegaup`				

Table 4: Italic greek

α	`\alphait`	β	`\betait`	γ	`\gammait`	δ	`\deltait`
ϵ	`\epsilonit`	ε	`\varepsilonit`	ζ	`\zetait`	η	`\etait`
θ	`\thetait`	ϑ	`\varthetait`	ι	`\iotait`	κ	`\kappait`
$\varkappa$	`\varkappait`	λ	`\lambdait`	μ	`\muit`	ν	`\nuit`
ξ	`\xiit`	o	`\omikronit`	π	`\piit`	ϖ	`\varpiit`
ρ	`\rhoit`	ϱ	`\varrhoit`	σ	`\sigmait`	ς	`\varsigmait`
τ	`\tauit`	υ	`\upsilonit`	ϕ	`\phiit`	φ	`\varphiit`
χ	`\chiit`	ψ	`\psiit`	ω	`\omegait`		
A	`\Alphait`	B	`\Betait`	$\mathit{\Gamma}$	`\Gammait`	$\mathit{\Delta}$	`\Deltait`
E	`\Epsilonit`	Z	`\Zetait`	H	`\Etait`	$\mathit{\Theta}$	`\Thetait`
I	`\Iotait`	K	`\Kappait`	$\mathit{\Lambda}$	`\Lambdait`	M	`\Muit`
N	`\Nuit`	$\mathit{\Xi}$	`\Xiit`	O	`\Omikronit`	$\mathit{\Pi}$	`\Piit`
P	`\Rhoit`	$\mathit{\Sigma}$	`\Sigmait`	T	`\Tauit`	$\mathit{\Upsilon}$	`\Upsilonit`
Y	`\varUpsilonit`	$\mathit{\Phi}$	`\Phiit`	X	`\Chiit`	$\mathcal{X}$	`\varChiit`
$\mathit{\Psi}$	`\Psiit`	$\mathit{\Omega}$	`\Omegait`	$\digamma$	`\digamma`		

The greek is set up so that you can use names without shape qualifiers as in the old math setup, i. e. `\Gamma` will yield an upright Γ and `\alpha` will yield an italic α.

Table 5: Binary operations

$+$	`+`	$\cap$	`\cap`	$\Diamond$	`\diamond`	$\oplus$	`\oplus`
$-$	`-`	$\cup$	`\cup`	$\diamond$	`\Diamond`	$\ominus$	`\ominus`
$\pm$	`\pm`	$\uplus$	`\uplus`	$\bigtriangleup$	`\bigtriangleup`	$\otimes$	`\otimes`
$\mp$	`\mp`	$\sqcap$	`\sqcap`	$\bigtriangledown$	`\bigtriangledown`	$\oslash$	`\oslash`
$\times$	`\times`	$\sqcup$	`\sqcup`	$\triangleleft$	`\triangleleft`	$\odot$	`\odot`
$\div$	`\div`	$\vee$	`\vee`, `\lor`	$\triangleright$	`\triangleright`	$\bigcirc$	`\bigcirc`
$\divideontimes$	`\divideontimes`	$\wedge$	`\wedge`, `\land`	$\ltimes$	`\ltimes`	$\circ$	`\circ`
$\ast$	`\ast`	$\&$	`\ampersand`	$\rtimes$	`\rtimes`	$\bullet$	`\bullet`
$\star$	`\star`	⅋	`\dnasrepma`	$\bowtie$	`\bowtie`, `\Join`	$\cdot$	`\cdot`
$\amalg$	`\amalg`	$\setminus$	`\setminus`	$\wr$	`\wr`		

Table 6: Relations

$<$	`<`	$>$	`>`	$\prec$	`\prec`	$\succ$	`\succ`
$\nless$	`\nless`	$\ngtr$	`\ngtr`	$\nprec$	`\nprec`	$\nsucc$	`\nsucc`
$\leq$	`\le`, `\leq`	$\geq$	`\ge`, `\geq`	$\preceq$	`\preceq`	$\succeq$	`\succeq`
$\nleq$	`\nleq`	$\ngeq$	`\ngeq`	$\npreceq$	`\npreceq`	$\nsucceq$	`\nsucceq`
$\leqslant$	`\leqslant`	$\geqslant$	`\geqslant`	$\preccurlyeq$	`\preccurlyeq`	$\succcurlyeq$	`\succcurlyeq`
$\nleqslant$	`\nleqslant`	$\ngeqslant$	`\ngeqslant`	$\not\preccurlyeq$	`\npreccurlyeq`	$\not\succcurlyeq$	`\nsucccurlyeq`
$\lesssim$	`\lesssim`	$\gtrsim$	`\gtrsim`	$\precsim$	`\precsim`	$\succsim$	`\succsim`
$\not\lesssim$	`\nlesssim`	$\not\gtrsim$	`\ngtrsim`	$\not\precsim$	`\nprecsim`	$\not\succsim$	`\nsuccsim`
$\ll$	`\ll`	$\gg$	`\gg`	$\lll$	`\lll`,`\llless`	$\ggg$	`\ggg`, `\gggtr`
$\subset$	`\subset`	$\supset$	`\supset`	$\sqsubset$	`\sqsubset`	$\sqsupset$	`\sqsupset`
$\subseteq$	`\subseteq`	$\supseteq$	`\supseteq`	$\sqsubseteq$	`\sqsubseteq`	$\sqsupseteq$	`\sqsupseteq`
$=$	`=`	$\in$	`\in`	$\ni$	`\ni`, `\owns`	$\models$	`\models`
$\neq$	`\neq`	$\notin$	`\notin`	$\not\ni$	`\notowner`	⫤	`\satisfied`
$\sim$	`\sim`	$\approx$	`\approx`	$\cong$	`\cong`	$\backsim$	`\backsim`
$\nsim$	`\nsim`	$\not\approx$	`\napprox`	$\ncong$	`\ncong`	$\asymp$	`\asymp`
$\simeq$	`\simeq`	$\approxeq$	`\approxeq`	$\equiv$	`\equiv`	$\backsimeq$	`\backsimeq`
$\doteq$	`\doteq`	$\mid$	`\mid`	$\parallel$	`\parallel`	$\vert\vert\vert$	`\interleaving`
$\vdash$	`\vdash`	$\dashv$	`\dashv`	$:$	`:`	$\between$	`\between`
$\nvdash$	`\nvdash`	$\not\dashv$	`\ndashv`	$\propto$	`\propto`	$\perp$	`\perp`
$\smile$	`\smile`	$\frown$	`\frown`	$\leadsto$	`\leadsto`		

$\vartriangleleft$	`\vartriangleleft`	$\vartriangleright$	`\vartriangleright`	$\trianglelefteq$	`\trianglelefteq`
$\ntriangleleft$	`\ntriangleleft`	$\ntriangleright$	`\ntriangleright`	$\trianglerighteq$	`\trianglerighteq`
$\ntrianglelefteq$	`\ntrianglelefteq`	$\ntrianglerighteq$	`\ntrianglerighteq`		

Table 8: Arrows

$\leftarrow$	`\leftarrow`, `\gets`	$\longleftarrow$	`\longleftarrow`	$\uparrow$	`\uparrow`
$\Leftarrow$	`\Leftarrow`	$\Longleftarrow$	`\Longleftarrow`	$\Uparrow$	`\Uparrow`
$\rightarrow$	`\rightarrow`, `\to`	$\longrightarrow$	`\longrightarrow`	$\downarrow$	`\downarrow`
$\Rightarrow$	`\Rightarrow`	$\Longrightarrow$	`\Longrightarrow`	$\Downarrow$	`\Downarrow`

$\leftrightarrow$	`\leftrightarrow`	$\longleftrightarrow$	`\longleftrightarrow`	$\updownarrow$	`\updownarrow`
$\Leftrightarrow$	`\Leftrightarrow`	$\Longleftrightarrow$	`\Longleftrightarrow`	$\Updownarrow$	`\Updownarrow`
$\mapsto$	`\mapsto`	$\longmapsto$	`\longmapsto`	$\nearrow$	`\nearrow`
⤇	`\Mapsto`	⟾	`\Longmapsto`	$\searrow$	`\searrow`
↤	`\mapsfrom`	⟻	`\longmapsfrom`	$\swarrow$	`\swarrow`
⤆	`\Mapsfrom`	⟽	`\Longmapsfrom`	$\nwarrow$	`\nwarrow`
$\hookleftarrow$	`\hookleftarrow`	$\leftharpoonup$	`\leftharpoonup`	$\rightharpoonup$	`\rightharpoonup`
$\hookrightarrow$	`\hookrightarrow`	$\leftharpoondown$	`\leftharpoondown`	$\rightharpoondown$	`\rightharpoondown`

Table 9: Other symbols

.	.	$\flat$	`\flat`	$\natural$	`\natural`	$\sharp$	`\sharp`
$\dagger$	`\dagger`	$\ddagger$	`\ddagger`	$\Re$	`\Re`	$\Im$	`\Im`
$\aleph$	`\aleph`	$\beth$	`\beth`	$\gimel$	`\gimel`	$\daleth$	`\daleth`
þ	`\thorn`	ð	`\eth`	∂	`\partialup`	∂	`\partialit`
d	`\dup`	$\wp$	`\wp`	ƛ	`\lambdabarup`	ƛ	`\lambdabarit`
$\exists$	`\exists`	$\forall$	`\forall`	$\Game$	`\Game`	$\Finv$	`\Finv`
$\nexists$	`\nexists`	℧	`\Qinv`	$\mho$	`\mho`	$\amalg$	`\amalg`
∞	`\infty`	ℓ	`\ell`	∇	`\nabla`	$\emptyset$	`\emptyset`
$\square$	`\square`	@	`@`	$\hbar$	`\hbar`	$\hslash$	`\hslash`
$\prime$	`\prime`	$\backprime$	`\backprime`	#	`\hash`	%	`\percent`
-	`\negated`	$\neg$	`\neg`, `\lnot`	$\angle$	`\angle`	/	`/`
$\top$	`\top`	$\bot$	`\bot`	╱	`\diagup`	╲	`\diagdown`
$\ldots$	`\mathellipsis`	$\cdots$	`\cdots`	$\vdots$	`\vdots`	$\ddots$	`\ddots`
_	`\mathunderscore`	϶	`\backepsilon`	℩	`\inviota`		

Table 10: Big operators

$\int$	`\int`	$\iint$	`\iint`	$\iiint$	`\iiint`	$\biguplus$	`\biguplus`
$\oint$	`\oint`	∯	`\oiint`	$\bigcap$	`\bigcap`	$\bigcup$	`\bigcup`
$\bigoplus$	`\bigoplus`	$\prod$	`\prod`	⨅	`\bigsqcap`	$\bigsqcup$	`\bigsqcup`
$\bigotimes$	`\bigotimes`	$\coprod$	`\coprod`	$\bigwedge$	`\bigwedge`	$\bigvee$	`\bigvee`
$\bigodot$	`\bigodot`	$\sum$	`\sum`				

Table 11: Large delimiters

(	`(`	)	`)`	[	`[`	]	`]`
$\{$	`\lbrace`	$\}$	`\rbrace`	$\lceil$	`\lceil`	$\rceil$	`\rceil`
$\langle$	`\langle`	$\rangle$	`\rangle`	$\lfloor$	`\lfloor`	$\rfloor$	`\rfloor`
$\lgroup$	`\lgroup`	$\rgroup$	`\rgroup`	⟦	`\lsemantic`	⟧	`\rsemantic`
$\lmoustache$	`\lmoustache`	$\rmoustache$	`\rmoustache`	/	`/`	$\backslash$	`\backslash`
$\uparrow$	`\uparrow`	$\downarrow$	`\downarrow`	$\updownarrow$	`\updownarrow`		
$\Uparrow$	`\Uparrow`	$\Downarrow$	`\Downarrow`	$\Updownarrow$	`\Updownarrow`		
$\vert$	`|`, `\vert`,	$\Vert$	`|`, `\Vert`,	⦀	`\vvert`,	╻	`\bracevert`,
	`\lvert`,		`\lVert`,		`\lvvert`,		`\lbracevert`,
	`\rvert`		`\rVert`		`\rvvert`		`\rbracevert`

Table 12: Mathematical constructs

$\widehat{abc}$	\widehat{abc}	$\widetilde{abc}$	\widetilde{abc}
$\overleftarrow{abc}$	\overleftarrow{abc}	$\overrightarrow{abc}$	\overrightarrow{abc}
$\overline{abc}$	\overline{abc}	$\underline{abc}$	\underline{abc}
$\overbrace{abc}$	\overbrace{abc}	$\overgroup{abc}$	\overgroup{abc}
$\underbrace{abc}$	\underbrace{abc}	$\undergroup{abc}$	\undergroup{abc}
$\sqrt{abc}$	\sqrt{abc}	$\sqrt[n]{abc}$	\sqrt[n]{abc}
f'	f'	$\frac{abc}{xyz}$	\frac{abc}{xyz}

Table 13: Additional math alphabets (with the amssymb option)

$\mathbb{ABab01}$	\mathbb{ABab01}	$\mathfrak{ABab01}$	\mathfrak{ABab01}

Table 14: Additional accents (with the amssymb option)

$\overset{\frown}{a}$	\paren{a}	$\breve{a}$	\pareninv{a}	$\hat{a}$	\tria{a}	$\check{a}$	\triainv{a}

Table 15: Additional binary operations (with the amssymb option)

$\boxplus$	\boxplus	$\boxminus$	\boxminus	$\boxtimes$	\boxtimes	$\boxdot$	\boxdot
$\circleddash$	\circleddash	$\circledast$	\circledast	$\circledcirc$	\circledcirc	$\ominus$	\operp
$\leftthreetimes$	\leftthreetimes	$\dot{\cap}$	\capdot	$\curlywedge$	\curlywedge	$\Cap$	\Cap, \doublecap
$\rightthreetimes$	\rightthreetimes	$\dot{\cup}$	\cupdot	$\curlyvee$	\curlyvee	$\Cup$	\Cup, \doublecap
$\blacktriangleleft$	\blacktriangleleft	$\doublebarwedge$	\doublebarwedge	$\barwedge$	\barwedge	$\square$	\oblong
$\blacktriangleright$	\blacktriangleright	$\smallsetminus$	\smallsetminus	$\veebar$	\veebar	$\dotplus$	\dotplus
$[\,]$	\dijkstrachoice	$\centerdot$	\centerdot	$\intercal$	\intercal		

Table 16: Additional relations (with the amssymb option)

$\eqslantless$	\eqslantless	$\eqslantgtr$	\eqslantgtr	$\lnsim$	\lnsim	$\gnsim$	\gnsim
$\lessapprox$	\lessapprox	$\gtrapprox$	\gtrapprox	$\lnapprox$	\lnapprox	$\gnapprox$	\gnapprox
$\curlyeqprec$	\curlyeqprec	$\curlyeqsucc$	\curlyeqsucc	$\precnsim$	\precnsim	$\succnsim$	\succnsim
$\precapprox$	\precapprox	$\succapprox$	\succapprox	$\lessdot$	\lessdot	$\gtrdot$	\gtrdot
$\precnapprox$	\precnapprox	$\succnapprox$	\succnapprox	$\lessgtr$	\lessgtr	$\gtrless$	\gtrless
$\lvertneqq$	\lvertneqq	$\gvertneqq$	\gvertneqq	$\leqq$	\leqq	$\geqq$	\geqq
$\lesseqgtr$	\lesseqgtr	$\gtreqless$	\gtreqless	$\nleqq$	\nleqq	$\ngeqq$	\ngeqq
$\lesseqqgtr$	\lesseqqgtr	$\gtreqqless$	\gtreqqless	$\lneq$	\lneq	$\gneq$	\gneq
$\nsubseteq$	\nsubseteq	$\nsupseteq$	\nsupseteq	$\lneqq$	\lneqq	$\gneqq$	\gneqq
$\subseteqq$	\subseteqq	$\supseteqq$	\supseteqq	$\Subset$	\Subset	$\Supset$	\Supset
$\subsetneq$	\subsetneq	$\supsetneq$	\supsetneq	$\therefore$	\therefore	$\because$	\because
$\nsubseteqq$	\nsubseteqq	$\nsupseteqq$	\nsupseteqq	$\bumpeq$	\bumpeq	$\Bumpeq$	\Bumpeq
$\subsetneqq$	\subsetneqq	$\supsetneqq$	\supsetneqq	$\circeq$	\circeq	$\triangleq$	\triangleq
$\varsubsetneqq$	\varsubsetneqq	$\varsupsetneqq$	\varsupsetneqq	$\smallsmile$	\smallsmile	$\smallfrown$	\smallfrown
$\risingdotseq$	\risingdotseq	$\fallingdotseq$	\fallingdotseq	$\doteqdot$	\doteqdot, \Doteq	$\varpropto$	\varpropto

$\Vdash$	\Vdash	$\VDash$	\VDash	$\Vvdash$	\Vvdash	$\vDash$	\vDash
$\nVdash$	\nVdash	$\nVDash$	\nVDash	⫫̸	\nVvdash	$\nvDash$	\nvDash
⫣	\dashV	⫤	\DashV	⫣	\dashVv	⫤	\Dashv
⫣̸	\ndashV	⫤̸	\nDashV	⫣̸	\ndashVv	⫤̸	\nDashv
$\nshortmid$	\nshortmid	$\nshortparallel$	\nshortparallel	$\nmid$	\nmid	$\nparallel$	\nparallel
$\shortmid$	\shortmid	$\shortparallel$	\shortparallel				

Table 17: Additional arrows (with the amssymb option)

$\circlearrowleft$	\circlearrowleft	$\curvearrowleft$	\curvearrowleft	$\Lsh$	\Lsh
$\circlearrowright$	\circlearrowright	$\curvearrowright$	\curvearrowright	$\Rsh$	\Rsh
$\dashleftarrow$	\dashleftarrow	$\twoheadleftarrow$	\twoheadleftarrow	$\leftleftarrows$	\leftleftarrows
$\dashrightarrow$	\dashrightarrow	$\twoheadrightarrow$	\twoheadrightarrow	$\rightrightarrows$	\rightrightarrows
$\leftarrowtail$	\leftarrowtail	$\looparrowleft$	\looparrowleft	$\leftrightarrows$	\leftrightarrows
$\rightarrowtail$	\rightarrowtail	$\looparrowright$	\looparrowright	$\rightleftarrows$	\rightleftarrows
$\upuparrows$	\upuparrows	$\upharpoonleft$	\upharpoonleft	$\Lleftarrow$	\Lleftarrow
$\downdownarrows$	\downdownarrows	$\downharpoonleft$	\downharpoonleft	$\Rrightarrow$	\Rrightarrow
⬿	\leftsquigarrow	$\nleftarrow$	\nleftarrow	$\nLeftarrow$	\nLeftarrow
$\rightsquigarrow$	\rightsquigarrow	$\nrightarrow$	\nrightarrow	$\nRightarrow$	\nRightarrow
$\leftrightsquigarrow$	\leftrightsquigarrow	$\nleftrightarrow$	\nleftrightarrow	$\nLeftrightarrow$	\nLeftrightarrow
$\leftrightharpoons$	\leftrightharpoons	$\rightleftharpoons$	\rightleftharpoons	⧟	\multimap

You can also use the generic arrow kit commands for creating arbitrary arrows and I should probably explain them here...

Table 18: Additional symbols (with the amssymb option)

$\blacktriangle$	\blacktriangle	$\vartriangle$	\vartriangle	$\blacklozenge$	\blacklozenge
$\blacktriangledown$	\blacktriangledown	$\triangledown$	\triangledown	$\lozenge$	\lozenge
$\blacksquare$	\blacksquare	$\bigstar$	\bigstar	$\varnothing$	\varnothing
$\square$	\smallsquare	$\vartriangle$	\smalltriangle	$\complement$	\complement
$\measuredangle$	\measuredangle	$\sphericalangle$	\sphericalangle	$\checkmark$	\checkmark
$\Bbbk$	\Bbbk				

Table 19: Additional big operators (with the extraops option)

■	\sigmaint	■	\slashint	#	\bighash
&	\bigampersand	⅋	\bigdnasrepma	$\times$	\bigtimes
‖	\bigparallel	⫼	\biginterleaving	⦹	\bigoperp
⟦⟧	\bigdijkstrachoice	⩀	\bigcapdot	$\boxplus$	\bigboxplus
$*$	\bigast	⊍	\bigcupdot	$\boxtimes$	\bigboxtimes
$+$	\bigplus	▯	\bigoblong		

Table 20: Additional large delimiters (with the extraops option)

⦃	\lmultiset	⦄	\rmultiset	⦉	\ltriangle	⦊	\rtriangle
⟦	\lGroup	⟧	\rGroup	⦅	\ltortoise	⦆	\rtortoise

Table 21: Additional mathematical constructs (with the `extraops` option)

abc	`\widebar{abc}`	abc	`\widearc{abc}`
abc	`\widevector{abc}`	abc	`\widebackvector{abc}`
abc	`\widedoublevector{abc}`	abc	`\wideparen{abc}`
abc	`\widetriangle{abc}`		

Table 22: Addtional symbols (with the `textcomp` option)

¶	`\mathparagraph`	§	`\mathsection`	®	`\circledR`
¥	`\yen`	£	`\mathsterling`	$	`\mathdollar`

Table 23: Under accents (with the `accents` option)

a	`\ugrave{a}`	a	`\uacute{a}`	a	`\ugraveinv{a}`	a	`\uacuteinv{a}`
a	`\uhat{a}`	a	`\ucheck{a}`	a	`\uarc{a}`	a	`\ubreve{a}`
a	`\uparen{a}`	a	`\upareninv{a}`	a	`\utria{a}`	a	`\utriainv{a}`
a	`\utilde{a}`	a	`\uring{a}`	a	`\uupbrack{a}`	a	`\udownbrack{a}`
$\underline{a}$	`\ubar{a}`	a	`\uvec{a}`	a	`\urvec{a}`	a	`\udvec{a}`
a	`\udot{a}`	a	`\uddot{a}`	a	`\udddot{a}`		

The `accents` option also defines nesting versions of all accents and under accents. There are for instance `\Hat` and `\uCheck` accents. I should say more here...

3 Version information

```
⟨newmath | oldmath⟩ \NeedsTeXFormat{LaTeX2e}
⟨newmath⟩ \ProvidesPackage{newmath}
⟨oldmath⟩ \ProvidesPackage{oldmath}
⟨cfg⟩ \ProvidesFile{fontmath.cfg}
⟨cm⟩ \ProvidesFile{cm.mfd}
⟨euler⟩ \ProvidesFile{euler.mfd}
⟨concrete⟩ \ProvidesFile{concrete.mfd}
⟨mathptm⟩ \ProvidesFile{mathptm.mfd}
⟨mathematica⟩ \ProvidesFile{mathematica.mfd}
⟨lucida&!lucidexp⟩ \ProvidesFile{lucida.mfd}
⟨lucida & lucidexp⟩ \ProvidesFile{lucidexp.mfd}
⟨mathtime&!mathplus⟩ \ProvidesFile{mathtime.mfd}
⟨mathtime & mathplus⟩ \ProvidesFile{mathplus.mfd}
[1998/04/20 v0.59
⟨newmath | cfg⟩ New
```

```
⟨oldmath⟩ Old
⟨newmath | cfg | oldmath⟩ math setup
⟨cm⟩ Computer Modern
⟨euler⟩ Euler
⟨concete⟩ Concrete
⟨mathptm⟩ Mathptm
⟨mathematica⟩ Mathematica
⟨lucida⟩ Lucida New Math
⟨lucidexp⟩ (+Expert)
⟨mathtime⟩ MathTime
⟨mathplus⟩ (+Plus)
⟨cm | euler | concrete | mathptm | lucida | mathtime⟩ math layout
]
```

4 The cfg file

We provide a `fontmath.cfg` file which can be used to create a LaTeX format containing the new math setup. The `newmath` and `oldmath` packages below are designed to work with a format regardless if if contains the new math setup or not.

Later on we use `\ifx\M@layout\@undefined` to check if the new math setup is loaded. Alternatively, we could check wether the encoding of the `symbols` alphabet is OMS or MC, but this solution is much simpler and serves the additional purpose to have the selected layout ready for inspection. Using an initial value which is not a valid layout option is necessary to check later if the user has specified an explicit layout option.

```
⟨*cfg⟩
\def\M@layout{none}
```

I hope this is silently ignored when used in a package!

```
⟨cfg⟩\addto@hook\everyjob{\typeout{New math setup <v0.59 > loaded.}}
```

We temporarily use some code by David Carlisle in the `cfg` file that fixes a bug in `\DeclareSymbolFont`. This fix is in LaTeX 1997/12/01 and will be automatically excluded by `newmath.ins` if it detects a newer format.

```
⟨*fixDeclareSymbolFont⟩
\def\DeclareSymbolFont#1#2#3#4#5{%
 \@tempswafalse
 \edef\reserved@b{#2}%
 \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
      \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
 \cdp@list
 \if@tempswa
   \@ifundefined{sym#1}{%
      \expandafter\new@mathgroup\csname sym#1\endcsname
      \expandafter\new@symbolfont\csname sym#1\endcsname
                        {#2}{#3}{#4}{#5}}%
     {%
      \@font@info{Redeclaring symbol font `#1'}%
%% new \group@elt update code!!!!
\def\group@elt##1##2{%
                \noexpand\group@elt\noexpand##1%
          \expandafter\ifx\csname sym#1\endcsname##1%
```

```
            \expandafter\noexpand\csname#2/#3/#4/#5\endcsname
          \else
              \noexpand##2%
          \fi}%
      \xdef\group@list{\group@list}%
      \def\version@elt##1{%
          \expandafter
          \SetSymbolFont@\expandafter##1\csname#2/#3/#4/#5\expandafter
              \endcsname \csname sym#1\endcsname
          }%
      \version@list
     }%
  \else
    \@latex@error{Encoding scheme  `#2' unknown}\@eha
  \fi
  }
⟨/fixDeclareSymbolFont⟩
```

\ProvideSymbolFont

This macro changes a symbol font only if the encoding exists. The following code to check if an encoding exists is stolen from `\SetSymbolFont`. It would be better to avoid doing the same check again in `\SetSymbolFont`.

```
\def\@ifisencoding#1#2#3{%
 \@tempswafalse
 \edef\reserved@b{#1}%
 \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
      \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
 \cdp@list
 \if@tempswa#2\else#3\fi}

\def\ProvideSymbolFont#1#2#3#4#5#6{%
 \@ifisencoding{#3}{\SetSymbolFont{#1}{#2}{#3}{#4}{#5}{#6}}{}}
```

\DeclareCompoundMathSymbol

This macro should be used to declare any symbol which is more complicated than a simple `\mathchardef`. `#1` is the control sequence to be defined, `#2` is the symbol class, e. g. `\mathrel`, and `#3` is the code that generates the symbol.

```
\let\define@compound\edef
\providecommand{\DeclareCompoundMathSymbol}[3]{\define@compound#1{#2{#3}}}
```

We use the same technique as `amsmath` to make `\mathalpha` accents behave properly. The `\@noaccents` flag indicates that the encoding doesn't contain accents in T1 positions.

```
\def\accentclass@{7}
\def\noaccents@{\def\accentclass@{0}}
```

4.1 Plain LaTeX math

4.1.1 NFSS settings

The extensible fonts can be loaded in some variants. They may or may not have many sizes and they may or may not scale. To support this, we define `\@extshape` and `\@ExtensibleFontShape`. The `manysizes` option will redefine `\@extshape` as 's' and the `noexscale` option will redefine `\@ExtensibleFontShape` to load the extensible fonts in one size.

We rely on the same communication mechanism between `mfd` and `fd` files that is used to implement the `scale` options for the Lucida layout (see ??).

The definitions for `\@ExtensibleFontShape` are suitable replacements for `\DeclareFontShape` only for fonts which have the design sizes 7pt, 8pt, 9pt and 10pt and are named according to the `genb` size function of NFSS.

```
\def\@extshape{n}
\def\@ExtensibleFontShape#1#2#3#4#5#6{%
 \DeclareFontShape{#1}{#2}{#3}{#4}{%
   <5><6><7><8><9>genb*#5%
   <10><10.95><12><14.4><17.28><20.74><24.88>#51000%
   }{#6}}

\DeclareFontEncoding{T1} {}{}
\DeclareFontEncoding{MC} {}{\noaccents@}
\DeclareFontEncoding{MXP}{}{}
\DeclareFontEncoding{MSP}{}{}

\DeclareFontSubstitution{MC} {cm}{m}{n}
\DeclareFontSubstitution{MXP}{cm}{m}{n}
\DeclareFontSubstitution{MSP}{cm}{m}{n}

\DeclareSymbolFont{operators}   {T1} {cmr}{m}{n}
\DeclareSymbolFont{letters}     {MSP}{cm}{m}{n}
\DeclareSymbolFont{symbols}     {MC} {cm}{m}{n}
\DeclareSymbolFont{largesymbols}{MXP}{cm}{m}{\@extshape}

\SetSymbolFont{operators}   {bold}{T1} {cmr}{bx}{n}
\SetSymbolFont{letters}     {bold}{MSP}{cm}{b} {n}
\SetSymbolFont{symbols}     {bold}{MC} {cm}{b} {n}
\SetSymbolFont{largesymbols}{bold}{MXP}{cm}{b} {\@extshape}

\DeclareSymbolFontAlphabet{\mathrm}    {operators}
\DeclareSymbolFontAlphabet{\mathnormal}{symbols}
\DeclareSymbolFontAlphabet{\mathcal}   {letters}

\DeclareMathAlphabet{\mathbf}  {T1}{cmr} {bx}{n}
\DeclareMathAlphabet{\mathsf}  {T1}{cmss}{m} {n}
\DeclareMathAlphabet{\mathit}  {T1}{cmr} {m} {it}
\DeclareMathAlphabet{\mathtt}  {T1}{cmtt}{m} {n}

\SetMathAlphabet{\mathsf}{bold}{T1}{cmss}{bx}{n}
\SetMathAlphabet{\mathit}{bold}{T1}{cmr} {bx}{it}

\def\operator@font{\mathgroup\symoperators}

\mathcode`\ ="8000 % \space
\mathcode`\'="8000 % ^\prime
\mathcode`\_="8000 % \_
```

There are some things which depend on the layout and are '`\fontdimen`-like', but for the one reason or the other, implementing them as `\fontdimen`'s would not be ideal. We give default values suitable for the cm layout here. They have to be overridden by the layout-changing options below.

```
\DeclareMathSizes{5}       {5}       {5}      {5}
\DeclareMathSizes{6}       {6}       {5}      {5}
\DeclareMathSizes{7}       {7}       {5}      {5}
\DeclareMathSizes{8}       {8}       {6}      {5}
\DeclareMathSizes{9}       {9}       {6}      {5}
\DeclareMathSizes{\@xpt}   {\@xpt}   {7}      {5}
\DeclareMathSizes{\@xipt}  {\@xipt}  {8}      {6}
\DeclareMathSizes{\@xiipt} {\@xiipt} {8}      {6}
\DeclareMathSizes{\@xivpt} {\@xivpt} {\@xpt}  {7}
\DeclareMathSizes{\@xviipt}{\@xviipt}{\@xiipt}{\@xpt}
\DeclareMathSizes{\@xxpt}  {\@xxpt}  {\@xivpt}{\@xiipt}
\DeclareMathSizes{\@xxvpt} {\@xxvpt} {\@xxpt} {\@xviipt}

\thinmuskip=3mu
\medmuskip=4mu plus 2mu minus 4mu
\thickmuskip=5mu plus 5mu
```

We use the `\skewchar` of MSP as a marker for unavailable symbols.

```
\DeclareMathSymbol{\gone@symbol}{\mathord}{symbols}{127}
\newcommand{\symbol@gone}[1]{\def#1{\symbol@@gone#1}}
\newcommand{\symbol@@gone}[1]{\gone@symbol
  \@latex@error{The command \noexpand#1 is no longer provided}
               {You may try the textcomp option.}}

\symbol@gone\mathparagraph
\symbol@gone\mathsterling
\symbol@gone\mathsection
\symbol@gone\mathdollar
\symbol@gone\clubsuit
\symbol@gone\diamondsuit
\symbol@gone\heartsuit
\symbol@gone\spadesuit
```

Some symbols are given a `\def` rather than a `\mathchardef` in the LaTeX kernel. We have to reset these or redefinition with `\DeclareMathSymbol` will fail.

```
\let\mho\relax
\let\Diamond\relax
\let\sqsubset\relax
\let\sqsupset\relax
\let\leadsto\relax
```

4.1.2 The MC encoding

Slots 0–7 are delimiters which are are declared in `largesymbols`.

```
\DeclareMathSymbol{|}            {\mathord}  {symbols}  {8}
\DeclareMathSymbol{\mid}         {\mathrel}  {symbols}  {8}
\DeclareMathSymbol{\parallel}    {\mathrel}  {symbols}  {9}
\DeclareMathSymbol{\interleaving}{\mathrel}  {symbols} {10}
\DeclareMathSymbol{\flat}        {\mathord}  {symbols} {11}
\DeclareMathSymbol{\natural}     {\mathord}  {symbols} {12}
\DeclareMathSymbol{\sharp}       {\mathord}  {symbols} {13}
\DeclareMathSymbol{\dagger}      {\mathord}  {symbols} {14}
\DeclareMathSymbol{\ddagger}     {\mathord}  {symbols} {15}
\DeclareMathSymbol{\aleph}       {\mathord}  {symbols} {16}
```

```
\DeclareMathSymbol{\beth}        {\mathord}  {symbols} {17}
\DeclareMathSymbol{\gimel}       {\mathord}  {symbols} {18}
\DeclareMathSymbol{\daleth}      {\mathord}  {symbols} {19}
\DeclareMathSymbol{\Re}          {\mathord}  {symbols} {20}
\DeclareMathSymbol{\Im}          {\mathord}  {symbols} {21}
\DeclareMathSymbol{\thorn}       {\mathord}  {symbols} {22}
\DeclareMathSymbol{\eth}         {\mathord}  {symbols} {23}
\DeclareMathSymbol{\emptyset}    {\mathord}  {symbols} {24}
\DeclareMathSymbol{\imath}       {\mathalpha}{symbols} {25}
\DeclareMathSymbol{\jmath}       {\mathalpha}{symbols} {26}
\DeclareMathSymbol{\between}     {\mathrel}  {symbols} {27}
\DeclareMathSymbol{\propto}      {\mathrel}  {symbols} {28}
\DeclareMathSymbol{\infty}       {\mathord}  {symbols} {29}
\DeclareMathSymbol{\prime}       {\mathord}  {symbols} {30}
\DeclareMathSymbol{\backprime}   {\mathord}  {symbols} {31}
```

Slot 32 is the space.

```
\DeclareMathSymbol{!}            {\mathclose}{symbols} {33}
```

Slots 34 and 36 are the semantic brackets.

```
\DeclareMathSymbol{\hash}        {\mathord}  {symbols} {35}
\DeclareMathSymbol{\percent}     {\mathord}  {symbols} {37}
\DeclareMathSymbol{\ampersand}   {\mathbin}  {symbols} {38}
\DeclareMathSymbol{\dnasrepma}   {\mathbin}  {symbols} {39}
\DeclareMathSymbol{(}            {\mathopen} {symbols} {40}
\DeclareMathSymbol{)}            {\mathclose}{symbols} {41}
\DeclareMathSymbol{*}            {\mathbin}  {symbols} {42}
\DeclareMathSymbol{\ast}         {\mathbin}  {symbols} {42}
\DeclareMathSymbol{\star}        {\mathbin}  {symbols} {43}
\DeclareMathSymbol{,}            {\mathpunct}{symbols} {44}
\DeclareMathSymbol{\cdot}        {\mathbin}  {symbols} {45}
\DeclareMathSymbol{\cdotp}       {\mathpunct}{symbols} {45}
\DeclareMathSymbol{.}            {\mathord}  {symbols} {46}
\DeclareMathSymbol{\ldotp}       {\mathpunct}{symbols} {46}
\DeclareMathSymbol{/}            {\mathord}  {symbols} {47}
\DeclareMathSymbol{0}            {\mathalpha}{symbols} {`0}
\DeclareMathSymbol{1}            {\mathalpha}{symbols} {`1}
\DeclareMathSymbol{2}            {\mathalpha}{symbols} {`2}
\DeclareMathSymbol{3}            {\mathalpha}{symbols} {`3}
\DeclareMathSymbol{4}            {\mathalpha}{symbols} {`4}
\DeclareMathSymbol{5}            {\mathalpha}{symbols} {`5}
\DeclareMathSymbol{6}            {\mathalpha}{symbols} {`6}
\DeclareMathSymbol{7}            {\mathalpha}{symbols} {`7}
\DeclareMathSymbol{8}            {\mathalpha}{symbols} {`8}
\DeclareMathSymbol{9}            {\mathalpha}{symbols} {`9}
\DeclareMathSymbol{:}            {\mathrel}  {symbols} {58}
\DeclareMathSymbol{\colon}       {\mathpunct}{symbols} {58}
\DeclareMathSymbol{;}            {\mathpunct}{symbols} {59}
```

Slot 60 and 62 are the angle delimiters, slot 61 is the raised radical.

```
\DeclareMathSymbol{?}            {\mathclose}{symbols} {63}
\DeclareMathSymbol{@}            {\mathord}  {symbols} {64}
\DeclareMathSymbol{A}            {\mathalpha}{symbols} {`A}
\DeclareMathSymbol{B}            {\mathalpha}{symbols} {`B}
```

```
\DeclareMathSymbol{C}            {\mathalpha}{symbols} {`C}
\DeclareMathSymbol{D}            {\mathalpha}{symbols} {`D}
\DeclareMathSymbol{E}            {\mathalpha}{symbols} {`E}
\DeclareMathSymbol{F}            {\mathalpha}{symbols} {`F}
\DeclareMathSymbol{G}            {\mathalpha}{symbols} {`G}
\DeclareMathSymbol{H}            {\mathalpha}{symbols} {`H}
\DeclareMathSymbol{I}            {\mathalpha}{symbols} {`I}
\DeclareMathSymbol{J}            {\mathalpha}{symbols} {`J}
\DeclareMathSymbol{K}            {\mathalpha}{symbols} {`K}
\DeclareMathSymbol{L}            {\mathalpha}{symbols} {`L}
\DeclareMathSymbol{M}            {\mathalpha}{symbols} {`M}
\DeclareMathSymbol{N}            {\mathalpha}{symbols} {`N}
\DeclareMathSymbol{O}            {\mathalpha}{symbols} {`O}
\DeclareMathSymbol{P}            {\mathalpha}{symbols} {`P}
\DeclareMathSymbol{Q}            {\mathalpha}{symbols} {`Q}
\DeclareMathSymbol{R}            {\mathalpha}{symbols} {`R}
\DeclareMathSymbol{S}            {\mathalpha}{symbols} {`S}
\DeclareMathSymbol{T}            {\mathalpha}{symbols} {`T}
\DeclareMathSymbol{U}            {\mathalpha}{symbols} {`U}
\DeclareMathSymbol{V}            {\mathalpha}{symbols} {`V}
\DeclareMathSymbol{W}            {\mathalpha}{symbols} {`W}
\DeclareMathSymbol{X}            {\mathalpha}{symbols} {`X}
\DeclareMathSymbol{Y}            {\mathalpha}{symbols} {`Y}
\DeclareMathSymbol{Z}            {\mathalpha}{symbols} {`Z}
\DeclareMathSymbol{[}            {\mathopen} {symbols} {91}
\DeclareMathSymbol{\setminus}    {\mathbin}  {symbols} {92}
\DeclareMathSymbol{]}            {\mathclose}{symbols} {93}
\DeclareMathSymbol{\hbar}        {\mathord}  {symbols} {94}
\DeclareMathSymbol{\hslash}      {\mathord}  {symbols} {95}
\DeclareMathSymbol{\dup}         {\mathord}  {symbols} {96}
\DeclareMathSymbol{a}            {\mathalpha}{symbols} {`a}
\DeclareMathSymbol{b}            {\mathalpha}{symbols} {`b}
\DeclareMathSymbol{c}            {\mathalpha}{symbols} {`c}
\DeclareMathSymbol{d}            {\mathalpha}{symbols} {`d}
\DeclareMathSymbol{e}            {\mathalpha}{symbols} {`e}
\DeclareMathSymbol{f}            {\mathalpha}{symbols} {`f}
\DeclareMathSymbol{g}            {\mathalpha}{symbols} {`g}
\DeclareMathSymbol{h}            {\mathalpha}{symbols} {`h}
\DeclareMathSymbol{i}            {\mathalpha}{symbols} {`i}
\DeclareMathSymbol{j}            {\mathalpha}{symbols} {`j}
\DeclareMathSymbol{k}            {\mathalpha}{symbols} {`k}
\DeclareMathSymbol{l}            {\mathalpha}{symbols} {`l}
\DeclareMathSymbol{m}            {\mathalpha}{symbols} {`m}
\DeclareMathSymbol{n}            {\mathalpha}{symbols} {`n}
\DeclareMathSymbol{o}            {\mathalpha}{symbols} {`o}
\DeclareMathSymbol{p}            {\mathalpha}{symbols} {`p}
\DeclareMathSymbol{q}            {\mathalpha}{symbols} {`q}
\DeclareMathSymbol{r}            {\mathalpha}{symbols} {`r}
\DeclareMathSymbol{s}            {\mathalpha}{symbols} {`s}
\DeclareMathSymbol{t}            {\mathalpha}{symbols} {`t}
\DeclareMathSymbol{u}            {\mathalpha}{symbols} {`u}
\DeclareMathSymbol{v}            {\mathalpha}{symbols} {`v}
\DeclareMathSymbol{w}            {\mathalpha}{symbols} {`w}
\DeclareMathSymbol{x}            {\mathalpha}{symbols} {`x}
```

```
\DeclareMathSymbol{y}            {\mathalpha}{symbols} {`y}
\DeclareMathSymbol{z}            {\mathalpha}{symbols} {`z}
```

Slots 123 and 125 are the brace delimiters.

```
\DeclareMathSymbol{\wp}          {\mathord}  {symbols} {124}
\DeclareMathSymbol{\ell}         {\mathord}  {symbols} {126}
```

Slot 127 is the `\skewchar`.

The following is a control glyph that can be used to switch between italic and upright greek.

```
\DeclareMathSymbol{\@GREEK}      {\mathord}  {symbols}{128}
\DeclareMathSymbol{\Alphaup}     {\mathord}  {symbols}{129}
\DeclareMathSymbol{\Betaup}      {\mathord}  {symbols}{130}
\DeclareMathSymbol{\Gammaup}     {\mathord}  {symbols}{131}
\DeclareMathSymbol{\Deltaup}     {\mathord}  {symbols}{132}
\DeclareMathSymbol{\Epsilonup}   {\mathord}  {symbols}{133}
\DeclareMathSymbol{\Zetaup}      {\mathord}  {symbols}{134}
\DeclareMathSymbol{\Etaup}       {\mathord}  {symbols}{135}
\DeclareMathSymbol{\Thetaup}     {\mathord}  {symbols}{136}
\DeclareMathSymbol{\Iotaup}      {\mathord}  {symbols}{137}
\DeclareMathSymbol{\Kappaup}     {\mathord}  {symbols}{138}
\DeclareMathSymbol{\Lambdaup}    {\mathord}  {symbols}{139}
\DeclareMathSymbol{\Muup}        {\mathord}  {symbols}{140}
\DeclareMathSymbol{\Nuup}        {\mathord}  {symbols}{141}
\DeclareMathSymbol{\Xiup}        {\mathord}  {symbols}{142}
\DeclareMathSymbol{\Omikronup}   {\mathord}  {symbols}{143}
\DeclareMathSymbol{\Piup}        {\mathord}  {symbols}{144}
\DeclareMathSymbol{\Rhoup}       {\mathord}  {symbols}{145}
\DeclareMathSymbol{\Sigmaup}     {\mathord}  {symbols}{146}
\DeclareMathSymbol{\Tauup}       {\mathord}  {symbols}{147}
\DeclareMathSymbol{\Upsilonup}   {\mathord}  {symbols}{148}
\DeclareMathSymbol{\Phiup}       {\mathord}  {symbols}{149}
\DeclareMathSymbol{\Chiup}       {\mathord}  {symbols}{150}
\DeclareMathSymbol{\Psiup}       {\mathord}  {symbols}{151}
\DeclareMathSymbol{\Omegaup}     {\mathord}  {symbols}{152}
\DeclareMathSymbol{\varUpsilonup}{\mathord}  {symbols}{153}
\DeclareMathSymbol{\varChiup}    {\mathord}  {symbols}{154}
\DeclareMathSymbol{\nabla}       {\mathord}  {symbols}{155}
\DeclareMathSymbol{\amalg}       {\mathbin}  {symbols}{156}
\DeclareMathSymbol{\mho}         {\mathord}  {symbols}{157}
```

Slots 158–159 are empty.

```
\DeclareMathSymbol{\partialup}   {\mathord}  {symbols}{160}
\DeclareMathSymbol{\alphaup}     {\mathord}  {symbols}{161}
\DeclareMathSymbol{\betaup}      {\mathord}  {symbols}{162}
\DeclareMathSymbol{\gammaup}     {\mathord}  {symbols}{163}
\DeclareMathSymbol{\deltaup}     {\mathord}  {symbols}{164}
\DeclareMathSymbol{\epsilonup}   {\mathord}  {symbols}{165}
\DeclareMathSymbol{\zetaup}      {\mathord}  {symbols}{166}
\DeclareMathSymbol{\etaup}       {\mathord}  {symbols}{167}
\DeclareMathSymbol{\thetaup}     {\mathord}  {symbols}{168}
\DeclareMathSymbol{\iotaup}      {\mathord}  {symbols}{169}
\DeclareMathSymbol{\kappaup}     {\mathord}  {symbols}{170}
\DeclareMathSymbol{\lambdaup}    {\mathord}  {symbols}{171}
```

```
\DeclareMathSymbol{\muup}          {\mathord}  {symbols}{172}
\DeclareMathSymbol{\nuup}          {\mathord}  {symbols}{173}
\DeclareMathSymbol{\xiup}          {\mathord}  {symbols}{174}
\DeclareMathSymbol{\omikronup}     {\mathord}  {symbols}{175}
\DeclareMathSymbol{\piup}          {\mathord}  {symbols}{176}
\DeclareMathSymbol{\rhoup}         {\mathord}  {symbols}{177}
\DeclareMathSymbol{\sigmaup}       {\mathord}  {symbols}{178}
\DeclareMathSymbol{\tauup}         {\mathord}  {symbols}{179}
\DeclareMathSymbol{\upsilonup}     {\mathord}  {symbols}{180}
\DeclareMathSymbol{\phiup}         {\mathord}  {symbols}{181}
\DeclareMathSymbol{\chiup}         {\mathord}  {symbols}{182}
\DeclareMathSymbol{\psiup}         {\mathord}  {symbols}{183}
\DeclareMathSymbol{\omegaup}       {\mathord}  {symbols}{184}
\DeclareMathSymbol{\varepsilonup}{\mathord}  {symbols}{185}
\DeclareMathSymbol{\varthetaup}    {\mathord}  {symbols}{186}
\DeclareMathSymbol{\varkappaup}    {\mathord}  {symbols}{187}
\DeclareMathSymbol{\varpiup}       {\mathord}  {symbols}{188}
\DeclareMathSymbol{\varrhoup}      {\mathord}  {symbols}{189}
\DeclareMathSymbol{\varsigmaup}    {\mathord}  {symbols}{190}
\DeclareMathSymbol{\varphiup}      {\mathord}  {symbols}{191}
```

Slot 192 is empty

```
\DeclareMathSymbol{\Alphait}       {\mathord}  {symbols}{193}
\DeclareMathSymbol{\Betait}        {\mathord}  {symbols}{194}
\DeclareMathSymbol{\Gammait}       {\mathord}  {symbols}{195}
\DeclareMathSymbol{\Deltait}       {\mathord}  {symbols}{196}
\DeclareMathSymbol{\Epsilonit}     {\mathord}  {symbols}{197}
\DeclareMathSymbol{\Zetait}        {\mathord}  {symbols}{198}
\DeclareMathSymbol{\Etait}         {\mathord}  {symbols}{199}
\DeclareMathSymbol{\Thetait}       {\mathord}  {symbols}{200}
\DeclareMathSymbol{\Iotait}        {\mathord}  {symbols}{201}
\DeclareMathSymbol{\Kappait}       {\mathord}  {symbols}{202}
\DeclareMathSymbol{\Lambdait}      {\mathord}  {symbols}{203}
\DeclareMathSymbol{\Muit}          {\mathord}  {symbols}{204}
\DeclareMathSymbol{\Nuit}          {\mathord}  {symbols}{205}
\DeclareMathSymbol{\Xiit}          {\mathord}  {symbols}{206}
\DeclareMathSymbol{\Omikronit}     {\mathord}  {symbols}{207}
\DeclareMathSymbol{\Piit}          {\mathord}  {symbols}{208}
\DeclareMathSymbol{\Rhoit}         {\mathord}  {symbols}{209}
\DeclareMathSymbol{\Sigmait}       {\mathord}  {symbols}{210}
\DeclareMathSymbol{\Tauit}         {\mathord}  {symbols}{211}
\DeclareMathSymbol{\Upsilonit}     {\mathord}  {symbols}{212}
\DeclareMathSymbol{\Phiit}         {\mathord}  {symbols}{213}
\DeclareMathSymbol{\Chiit}         {\mathord}  {symbols}{214}
\DeclareMathSymbol{\Psiit}         {\mathord}  {symbols}{215}
\DeclareMathSymbol{\Omegait}       {\mathord}  {symbols}{216}
\DeclareMathSymbol{\varUpsilonit}{\mathord}  {symbols}{217}
\DeclareMathSymbol{\varChiit}      {\mathord}  {symbols}{218}
\DeclareMathSymbol{\digamma}       {\mathord}  {symbols}{219}
\DeclareMathSymbol{\backepsilon}   {\mathord}  {symbols}{220}
\DeclareMathSymbol{\inviota}       {\mathord}  {symbols}{221}
\DeclareMathSymbol{\lambdabarup}   {\mathord}  {symbols}{222}
\DeclareMathSymbol{\lambdabarit}   {\mathord}  {symbols}{223}
\DeclareMathSymbol{\partialit}     {\mathord}  {symbols}{224}
```

```
\DeclareMathSymbol{\alphait}     {\mathord}  {symbols}{225}
\DeclareMathSymbol{\betait}      {\mathord}  {symbols}{226}
\DeclareMathSymbol{\gammait}     {\mathord}  {symbols}{227}
\DeclareMathSymbol{\deltait}     {\mathord}  {symbols}{228}
\DeclareMathSymbol{\epsilonit}   {\mathord}  {symbols}{229}
\DeclareMathSymbol{\zetait}      {\mathord}  {symbols}{230}
\DeclareMathSymbol{\etait}       {\mathord}  {symbols}{231}
\DeclareMathSymbol{\thetait}     {\mathord}  {symbols}{232}
\DeclareMathSymbol{\iotait}      {\mathord}  {symbols}{233}
\DeclareMathSymbol{\kappait}     {\mathord}  {symbols}{234}
\DeclareMathSymbol{\lambdait}    {\mathord}  {symbols}{235}
\DeclareMathSymbol{\muit}        {\mathord}  {symbols}{236}
\DeclareMathSymbol{\nuit}        {\mathord}  {symbols}{237}
\DeclareMathSymbol{\xiit}        {\mathord}  {symbols}{238}
\DeclareMathSymbol{\omikronit}   {\mathord}  {symbols}{239}
\DeclareMathSymbol{\piit}        {\mathord}  {symbols}{240}
\DeclareMathSymbol{\rhoit}       {\mathord}  {symbols}{241}
\DeclareMathSymbol{\sigmait}     {\mathord}  {symbols}{242}
\DeclareMathSymbol{\tauit}       {\mathord}  {symbols}{243}
\DeclareMathSymbol{\upsilonit}   {\mathord}  {symbols}{244}
\DeclareMathSymbol{\phiit}       {\mathord}  {symbols}{245}
\DeclareMathSymbol{\chiit}       {\mathord}  {symbols}{246}
\DeclareMathSymbol{\psiit}       {\mathord}  {symbols}{247}
\DeclareMathSymbol{\omegait}     {\mathord}  {symbols}{248}
\DeclareMathSymbol{\varepsilonit}{\mathord}  {symbols}{249}
\DeclareMathSymbol{\varthetait}  {\mathord}  {symbols}{250}
\DeclareMathSymbol{\varkappait}  {\mathord}  {symbols}{251}
\DeclareMathSymbol{\varpiit}     {\mathord}  {symbols}{252}
\DeclareMathSymbol{\varrhoit}    {\mathord}  {symbols}{253}
\DeclareMathSymbol{\varsigmait}  {\mathord}  {symbols}{254}
\DeclareMathSymbol{\varphiit}    {\mathord}  {symbols}{255}
```

4.1.3 The MSP encoding

We declare the T1 accents as `\mathalpha`, the other ones as `\mathord`. To make the `\noaccents@` trick work, we redefine `\set@mathaccent`.

```
\def\set@mathaccent#1#2#3#4{%
 \ifx#3\mathalpha
  \xdef#2{\mathaccent"\noexpand\accentclass@\hexnumber@#1#4\relax}
 \else
  \xdef#2{\mathaccent"\mathchar@type#3\hexnumber@#1#4\relax}
 \fi}

\DeclareMathAccent{\grave}          {\mathalpha}{letters} {0}
\DeclareMathAccent{\acute}          {\mathalpha}{letters} {1}
\DeclareMathAccent{\hat}            {\mathalpha}{letters} {2}
\DeclareMathAccent{\tilde}          {\mathalpha}{letters} {3}
\DeclareMathAccent{\ddot}           {\mathalpha}{letters} {4}
\DeclareMathAccent{\arc}            {\mathord}  {letters} {5}
\DeclareMathAccent{\ring}           {\mathalpha}{letters} {6}
\DeclareMathAccent{\check}          {\mathalpha}{letters} {7}
\DeclareMathAccent{\breve}          {\mathalpha}{letters} {8}
\DeclareMathAccent{\bar}            {\mathalpha}{letters} {9}
\DeclareMathAccent{\dot}            {\mathalpha}{letters}{10}
```

```
\DeclareMathAccent{\dddot}          {\mathord}  {letters}{11}
\DeclareMathAccent{\ddddot}         {\mathord}  {letters}{12}
\DeclareMathAccent{\vec}            {\mathord}  {letters}{13}
\DeclareMathAccent{\rvec}           {\mathord}  {letters}{14}
\DeclareMathAccent{\dvec}           {\mathord}  {letters}{15}
\DeclareMathAccent{\upbrack}        {\mathord}  {letters}{16}
\DeclareMathAccent{\downbrack}      {\mathord}  {letters}{17}
\DeclareMathAccent{\bardot}         {\mathord}  {letters}{18}
\DeclareMathAccent{\dotbar}         {\mathord}  {letters}{19}
\DeclareMathAccent{\barddot}        {\mathord}  {letters}{20}
\DeclareMathAccent{\ddotbar}        {\mathord}  {letters}{21}
\DeclareMathAccent{\hattilde}       {\mathord}  {letters}{22}
\DeclareMathAccent{\hatbar}         {\mathord}  {letters}{23}
\DeclareMathAccent{\doublebar}      {\mathord}  {letters}{24}
```

Slots 25 and 26 are the calligraphic dotless i and j.

```
\DeclareMathAccent{\graveinv}       {\mathord}  {letters}{27}
\DeclareMathAccent{\acuteinv}       {\mathord}  {letters}{28}
\DeclareMathSymbol{\smile}          {\mathrel}  {letters}{29}
\DeclareMathSymbol{\frown}          {\mathrel}  {letters}{30}
\DeclareMathSymbol{\asymp}          {\mathrel}  {letters}{31}
```

Slots 32 is the space.

```
\DeclareMathSymbol{\negated}        {\mathord}{letters} {33}
\DeclareMathSymbol{-}               {\mathbin}{letters} {34}
\DeclareMathSymbol{=}               {\mathrel}{letters} {35}
\DeclareMathSymbol{\equiv}          {\mathrel}{letters} {36}
\DeclareMathSymbol{+}               {\mathbin}{letters} {37}
\DeclareMathSymbol{\pm}             {\mathbin}{letters} {38}
\DeclareMathSymbol{\mp}             {\mathbin}{letters} {39}
```

Slot 40 is empty.

```
\DeclareMathSymbol{\doteq}          {\mathrel}{letters} {41}
\DeclareMathSymbol{\div}            {\mathbin}{letters} {42}
\DeclareMathSymbol{\divideontimes}  {\mathbin}{letters} {43}
\DeclareMathSymbol{\times}          {\mathbin}{letters} {44}
\DeclareMathSymbol{\ltimes}         {\mathbin}{letters} {45}
\DeclareMathSymbol{\rtimes}         {\mathbin}{letters} {46}
\DeclareMathSymbol{\bowtie}         {\mathbin}{letters} {47}
```

Slots 48–57 are the calligraphic digits.

```
\DeclareMathSymbol{\forall}         {\mathord}{letters} {58}
\DeclareMathSymbol{\exists}         {\mathord}{letters} {59}
\DeclareMathSymbol{\nexists}        {\mathord}{letters} {60}
\DeclareMathSymbol{\Finv}           {\mathord}{letters} {61}
\DeclareMathSymbol{\Game}           {\mathord}{letters} {62}
\DeclareMathSymbol{\Qinv}           {\mathord}{letters} {63}
\DeclareMathSymbol{\neg}            {\mathord}{letters} {64}
```

Slots 65–90 are the calligraphic uppercase alphabet.

```
\DeclareMathSymbol{\smallint}       {\mathop} {letters} {91}
\DeclareMathSymbol{\smalliint}      {\mathop} {letters} {92}
\DeclareMathSymbol{\smalliiint}     {\mathop} {letters} {93}
\DeclareMathSymbol{\smalloint}      {\mathop} {letters} {94}
\DeclareMathSymbol{\smalloiint}     {\mathop} {letters} {95}
```

Slot 96 is empty, slots 97–122 are the calligraphic lowercase alphabet. Slots 123–126 are empty, slot 127 is the `\skewchar`.

```
\DeclareMathSymbol{\cup}            {\mathbin}{letters}{128}
\DeclareMathSymbol{\cap}            {\mathbin}{letters}{129}
\DeclareMathSymbol{\sqcup}          {\mathbin}{letters}{130}
\DeclareMathSymbol{\sqcap}          {\mathbin}{letters}{131}
\DeclareMathSymbol{\wedge}          {\mathbin}{letters}{132}
\DeclareMathSymbol{\vee}            {\mathbin}{letters}{133}
\DeclareMathSymbol{\bigtriangleup}  {\mathbin}{letters}{134}
\DeclareMathSymbol{\bigtriangledown}{\mathbin}{letters}{135}
\DeclareMathSymbol{\uplus}          {\mathbin}{letters}{136}
\DeclareMathSymbol{\oplus}          {\mathbin}{letters}{137}
\DeclareMathSymbol{\ominus}         {\mathbin}{letters}{138}
\DeclareMathSymbol{\otimes}         {\mathbin}{letters}{139}
\DeclareMathSymbol{\oslash}         {\mathbin}{letters}{140}
\DeclareMathSymbol{\odot}           {\mathbin}{letters}{141}
\DeclareMathSymbol{\circ}           {\mathbin}{letters}{142}
\DeclareMathSymbol{\bullet}         {\mathbin}{letters}{143}
\DeclareMathSymbol{\subseteq}       {\mathrel}{letters}{144}
\DeclareMathSymbol{\supseteq}       {\mathrel}{letters}{145}
\DeclareMathSymbol{\subset}         {\mathrel}{letters}{146}
\DeclareMathSymbol{\supset}         {\mathrel}{letters}{147}
\DeclareMathSymbol{\sqsubseteq}     {\mathrel}{letters}{148}
\DeclareMathSymbol{\sqsupseteq}     {\mathrel}{letters}{149}
\DeclareMathSymbol{\sqsubset}       {\mathrel}{letters}{150}
\DeclareMathSymbol{\sqsupset}       {\mathrel}{letters}{151}
```

UV: The following symbol names are confusing. The glyphs really should be triangle operators from `lasy` or `msam`, which traditionally used to be called `\vartriangle`. The smaller triangles from `cmmi` should go elsewhere.

```
\DeclareMathSymbol{\vartriangleleft} {\mathrel}{letters}{152}
\DeclareMathSymbol{\triangleleft}    {\mathbin}{letters}{152}
\DeclareMathSymbol{\vartriangleright}{\mathrel}{letters}{153}
\DeclareMathSymbol{\triangleright}   {\mathbin}{letters}{153}
\DeclareMathSymbol{\trianglelefteq}  {\mathrel}{letters}{154}
\DeclareMathSymbol{\trianglerighteq} {\mathrel}{letters}{155}
\DeclareMathSymbol{\ntriangleleft}   {\mathrel}{letters}{156}
\DeclareMathSymbol{\ntriangleright}  {\mathrel}{letters}{157}
\DeclareMathSymbol{\ntrianglelefteq} {\mathrel}{letters}{158}
\DeclareMathSymbol{\ntrianglerighteq}{\mathrel}{letters}{159}
\DeclareMathSymbol{<}               {\mathrel}{letters}{160}
\DeclareMathSymbol{>}               {\mathrel}{letters}{161}
\DeclareMathSymbol{\leq}            {\mathrel}{letters}{162}
\DeclareMathSymbol{\geq}            {\mathrel}{letters}{163}
\DeclareMathSymbol{\leqslant}       {\mathrel}{letters}{164}
\DeclareMathSymbol{\geqslant}       {\mathrel}{letters}{165}
\DeclareMathSymbol{\lesssim}        {\mathrel}{letters}{166}
\DeclareMathSymbol{\gtrsim}         {\mathrel}{letters}{167}
\DeclareMathSymbol{\nless}          {\mathrel}{letters}{168}
\DeclareMathSymbol{\ngtr}           {\mathrel}{letters}{169}
\DeclareMathSymbol{\nleq}           {\mathrel}{letters}{170}
\DeclareMathSymbol{\ngeq}           {\mathrel}{letters}{171}
\DeclareMathSymbol{\nleqslant}      {\mathrel}{letters}{172}
\DeclareMathSymbol{\ngeqslant}      {\mathrel}{letters}{173}
```

```
\DeclareMathSymbol{\nlesssim}       {\mathrel}{letters}{174}
\DeclareMathSymbol{\ngtrsim}        {\mathrel}{letters}{175}
\DeclareMathSymbol{\prec}           {\mathrel}{letters}{176}
\DeclareMathSymbol{\succ}           {\mathrel}{letters}{177}
\DeclareMathSymbol{\preceq}         {\mathrel}{letters}{178}
\DeclareMathSymbol{\succeq}         {\mathrel}{letters}{179}
\DeclareMathSymbol{\preccurlyeq}    {\mathrel}{letters}{180}
\DeclareMathSymbol{\succcurlyeq}    {\mathrel}{letters}{181}
\DeclareMathSymbol{\precsim}        {\mathrel}{letters}{182}
\DeclareMathSymbol{\succsim}        {\mathrel}{letters}{183}
\DeclareMathSymbol{\nprec}          {\mathrel}{letters}{184}
\DeclareMathSymbol{\nsucc}          {\mathrel}{letters}{185}
\DeclareMathSymbol{\npreceq}        {\mathrel}{letters}{186}
\DeclareMathSymbol{\nsucceq}        {\mathrel}{letters}{187}
\DeclareMathSymbol{\npreccurlyeq}   {\mathrel}{letters}{188}
\DeclareMathSymbol{\nsucccurlyeq}   {\mathrel}{letters}{189}
\DeclareMathSymbol{\nprecsim}       {\mathrel}{letters}{190}
\DeclareMathSymbol{\nsuccsim}       {\mathrel}{letters}{191}
```

UV: Unfortunately, TeX doesn't consider ligatures for relation operators. Otherwise, it would be a nice idea to add ligatures for << and >>, which are often mistyped for $\ll$ and $\gg$ by unexperienced TeX users.

```
\DeclareMathSymbol{\ll}             {\mathrel}{letters}{192}
\DeclareMathSymbol{\gg}             {\mathrel}{letters}{193}
\DeclareMathSymbol{\lll}            {\mathrel}{letters}{194}
\DeclareMathSymbol{\ggg}            {\mathrel}{letters}{195}
\DeclareMathSymbol{\bigcirc}        {\mathbin}{letters}{196}
\DeclareMathSymbol{\square}         {\mathord}{letters}{197}
\DeclareMathSymbol{\Diamond}        {\mathbin}{letters}{198}
\DeclareMathSymbol{\diamond}        {\mathbin}{letters}{199}
\DeclareMathSymbol{\sim}            {\mathrel}{letters}{200}
\DeclareMathSymbol{\approx}         {\mathrel}{letters}{201}
\DeclareMathSymbol{\cong}           {\mathrel}{letters}{202}
\DeclareMathSymbol{\simeq}          {\mathrel}{letters}{203}
\DeclareMathSymbol{\backsim}        {\mathrel}{letters}{204}
\DeclareMathSymbol{\approxeq}       {\mathrel}{letters}{205}
\DeclareMathSymbol{\angle}          {\mathord}{letters}{206}
\DeclareMathSymbol{\modelsvert}     {\mathord}{letters}{207}
\DeclareMathSymbol{\nsim}           {\mathrel}{letters}{208}
\DeclareMathSymbol{\napprox}        {\mathrel}{letters}{209}
\DeclareMathSymbol{\ncong}          {\mathrel}{letters}{210}
\DeclareMathSymbol{\eqsim}          {\mathrel}{letters}{211}
\DeclareMathSymbol{\backsimeq}      {\mathrel}{letters}{212}
\DeclareMathSymbol{\wr}             {\mathbin}{letters}{213}
\DeclareMathSymbol{\not}            {\mathrel}{letters}{214}
\DeclareMathSymbol{\leadsto}        {\mathrel}{letters}{215}
\DeclareMathSymbol{\leftarrow}      {\mathrel}{letters}{216}
\DeclareMathSymbol{\rightarrow}     {\mathrel}{letters}{217}
\DeclareMathSymbol{\relbar}         {\mathord}{letters}{218}
\DeclareMathSymbol{\leftrightarrow} {\mathrel}{letters}{219}
\DeclareMathSymbol{\mapstochar}     {\mathord}{letters}{220}
\DeclareMathSymbol{\mapsfromchar}   {\mathord}{letters}{221}
```

Slots 222–223 are up arrow delimiters.

```
\DeclareMathSymbol{\Leftarrow}      {\mathrel}{letters}{224}
\DeclareMathSymbol{\Rightarrow}     {\mathrel}{letters}{225}
\DeclareMathSymbol{\Relbar}         {\mathord}{letters}{226}
\DeclareMathSymbol{\Leftrightarrow} {\mathrel}{letters}{227}
\DeclareMathSymbol{\Mapstochar}     {\mathord}{letters}{228}
\DeclareMathSymbol{\Mapsfromchar}   {\mathord}{letters}{229}
```

Slots 230–231 are down arrow delimiters.

```
\DeclareMathSymbol{\leftharpoonup}  {\mathrel}{letters}{232}
\DeclareMathSymbol{\rightharpoonup} {\mathrel}{letters}{233}
\DeclareMathSymbol{\leftharpoondown}{\mathrel}{letters}{234}
\DeclareMathSymbol{\rightharpoondown}{\mathrel}{letters}{235}
\DeclareMathSymbol{\rhook}          {\mathord}{letters}{236}
\DeclareMathSymbol{\lhook}          {\mathord}{letters}{237}
```

Slots 238–239 are up-down arrow delimiters.

```
\DeclareMathSymbol{\vdash}          {\mathrel}{letters}{240}
\DeclareMathSymbol{\dashv}          {\mathrel}{letters}{241}
\DeclareMathSymbol{\in}             {\mathrel}{letters}{242}
\DeclareMathSymbol{\ni}             {\mathrel}{letters}{243}
\DeclareMathSymbol{\top}            {\mathord}{letters}{244}
\DeclareMathSymbol{\diagup}         {\mathord}{letters}{245}
\DeclareMathSymbol{\nwarrow}        {\mathrel}{letters}{246}
\DeclareMathSymbol{\nearrow}        {\mathrel}{letters}{247}
\DeclareMathSymbol{\nvdash}         {\mathrel}{letters}{248}
\DeclareMathSymbol{\ndashv}         {\mathrel}{letters}{249}
\DeclareMathSymbol{\notin}          {\mathrel}{letters}{250}
\DeclareMathSymbol{\notowner}       {\mathrel}{letters}{251}
\DeclareMathSymbol{\bot}            {\mathord}{letters}{252}
\DeclareMathSymbol{\perp}           {\mathrel}{letters}{252}
\DeclareMathSymbol{\diagdown}       {\mathord}{letters}{253}
\DeclareMathSymbol{\swarrow}        {\mathrel}{letters}{254}
\DeclareMathSymbol{\searrow}        {\mathrel}{letters}{255}
```

Next we declare some compound symbols.

```
\begingroup
\let\define@compound\gdef
\DeclareCompoundMathSymbol{\neq}              {\mathrel}{\not=}
\DeclareCompoundMathSymbol{\hookleftarrow}    {\mathrel}{\mathord\leftarrow\rhook}
\DeclareCompoundMathSymbol{\hookrightarrow}   {\mathrel}{\lhook\mathord\rightarrow}
\DeclareCompoundMathSymbol{\models}           {\mathrel}{\modelsvert\Relbar}
\DeclareCompoundMathSymbol{\satisfied}        {\mathrel}{\Relbar\modelsvert}
\DeclareCompoundMathSymbol{\longleftarrow}    {\mathrel}{\mathord\leftarrow\relbar}
\DeclareCompoundMathSymbol{\longrightarrow}   {\mathrel}{\relbar\mathord\rightarrow}
\DeclareCompoundMathSymbol{\longleftrightarrow}{\mathrel}{%
                                             \mathord\leftarrow\mathord\rightarrow}
\DeclareCompoundMathSymbol{\Longleftarrow}    {\mathrel}{\mathord\Leftarrow\Relbar}
\DeclareCompoundMathSymbol{\Longrightarrow}   {\mathrel}{\Relbar\mathord\Rightarrow}
\DeclareCompoundMathSymbol{\Longleftrightarrow}{\mathrel}{%
                                             \mathord\Leftarrow\mathord\Rightarrow}
\DeclareCompoundMathSymbol{\iff}              {\mathrel}{%
                 \mskip\thickmuskip\mathord\Longleftrightarrow\mskip\thickmuskip}
\DeclareCompoundMathSymbol{\mapsto}           {\mathrel}{%
                                              \mapstochar\mathord\rightarrow}
```

```
\DeclareCompoundMathSymbol{\Mapsto}           {\mathrel}{%
                                         \Mapstochar\mathord\Rightarrow}
\DeclareCompoundMathSymbol{\mapsfrom}         {\mathrel}{%
                                        \mathord\leftarrow\mapsfromchar}
\DeclareCompoundMathSymbol{\Mapsfrom}         {\mathrel}{%
                                        \mathord\Leftarrow\Mapsfromchar}
\DeclareCompoundMathSymbol{\longmapsto}       {\mathrel}{%
                                        \mapstochar\relbar\mathord\rightarrow}
\DeclareCompoundMathSymbol{\Longmapsto}       {\mathrel}{%
                                        \Mapstochar\Relbar\mathord\Rightarrow}
\DeclareCompoundMathSymbol{\longmapsfrom}     {\mathrel}{%
                                        \mathord\leftarrow\relbar\mapsfromchar}
\DeclareCompoundMathSymbol{\Longmapsfrom}     {\mathrel}{%
                                        \mathord\Leftarrow\Relbar\Mapsfromchar}
\endgroup
  \def\rlh@#1{\vcenter{\m@th\hbox{\ooalign{\raise2pt
              \hbox{$#1\rightharpoonup$}\crcr
              $#1\leftharpoondown$}}}}
\def\rightleftharpoons{\mathrel{\mathpalette\rlh@{}}}
%\DeclareCompoundMathSymbol{\rightleftharpoons}{\mathrel}{\mathpalette\rlh@{}}
```

4.1.4 The MXP encoding

Slots 0–15 are the entry points to charlists of big delimiters. There should be at least four sizes for compatibility with cmex, i. e. three additional sizes in addition to the fixed slots, but more additional or intermediate sizes may be added at the font designers disposal.

```
\DeclareMathDelimiter{[}                          {symbols} {91}{largesymbols}{0}
\DeclareMathDelimiter{]}                          {symbols} {93}{largesymbols}{1}
\DeclareMathDelimiter{\lsemantic}  {\mathopen} {symbols} {34}{largesymbols}{2}
\DeclareMathDelimiter{\rsemantic}  {\mathclose}{symbols} {36}{largesymbols}{3}
\DeclareMathDelimiter{(}                          {symbols} {40}{largesymbols}{4}
\DeclareMathDelimiter{)}                          {symbols} {41}{largesymbols}{5}
\DeclareMathDelimiter{\lbrace}     {\mathopen} {symbols}{123}{largesymbols}{6}
\DeclareMathDelimiter{\rbrace}     {\mathclose}{symbols}{125}{largesymbols}{7}
\DeclareMathDelimiter{\lfloor}     {\mathopen} {symbols}  {0}{largesymbols}{8}
\DeclareMathDelimiter{\rfloor}     {\mathclose}{symbols}  {1}{largesymbols}{9}
\DeclareMathDelimiter{\lceil}      {\mathopen} {symbols}  {2}{largesymbols}{10}
\DeclareMathDelimiter{\rceil}      {\mathclose}{symbols}  {3}{largesymbols}{11}
\DeclareMathDelimiter{<}                          {symbols} {60}{largesymbols}{12}
\DeclareMathDelimiter{\langle}     {\mathopen} {symbols} {60}{largesymbols}{12}
\DeclareMathDelimiter{>}                          {symbols} {62}{largesymbols}{13}
\DeclareMathDelimiter{\rangle}     {\mathclose}{symbols} {62}{largesymbols}{13}
\DeclareMathDelimiter{/}                          {symbols} {47}{largesymbols}{14}
\expandafter\DeclareMathDelimiter\@backslashchar
                                                  {symbols} {92}{largesymbols}{15}
\DeclareMathDelimiter{\backslash}  {\mathord}  {symbols} {92}{largesymbols}{15}
```

Slots 16 and 24 are the entry points to a charlist of wide accents. There should be at least three, preferably five sizes for compatiblity with cmex or cmex with msbm, i. e. two or four additional sizes in addition to the fixed slots, but additional sizes may be added as long as there is room left.

```
\DeclareMathAccent{\widehat}  {\mathord}{largesymbols}{16}
```

```
\DeclareMathAccent{\widetilde}{\mathord}{largesymbols}{24}
```

Slots 17–20 and 25–28 contain the building blocks for horizontal braces. The correponding user-level macros are described below.

```
\DeclareMathSymbol{\braceld}  {\mathord}{largesymbols}{17}
\DeclareMathSymbol{\bracemd}  {\mathord}{largesymbols}{18}
\DeclareMathSymbol{\bracerd}  {\mathord}{largesymbols}{19}
\DeclareMathSymbol{\bracexd}  {\mathord}{largesymbols}{20}
\DeclareMathSymbol{\bracelu}  {\mathord}{largesymbols}{25}
\DeclareMathSymbol{\bracemu}  {\mathord}{largesymbols}{26}
\DeclareMathSymbol{\braceru}  {\mathord}{largesymbols}{27}
\DeclareMathSymbol{\bracexu}  {\mathord}{largesymbols}{28}
```

Slot 32 is the space, slots 33–35 are the vertical bars.

```
\DeclareMathDelimiter{|}                       {symbols}      {8}{largesymbols}{33}
\DeclareMathDelimiter{\vert}       {\mathord}  {symbols}      {8}{largesymbols}{33}
\DeclareMathDelimiter{\lvert}      {\mathopen} {symbols}      {8}{largesymbols}{33}
\DeclareMathDelimiter{\rvert}      {\mathclose}{symbols}      {8}{largesymbols}{33}
\DeclareMathDelimiter{\|}          {\mathord}  {symbols}      {9}{largesymbols}{34}
\DeclareMathDelimiter{\Vert}       {\mathord}  {symbols}      {9}{largesymbols}{34}
\DeclareMathDelimiter{\lVert}      {\mathopen} {symbols}      {9}{largesymbols}{34}
\DeclareMathDelimiter{\rVert}      {\mathclose}{symbols}      {9}{largesymbols}{34}
\DeclareMathDelimiter{\vvert}      {\mathord}  {symbols}     {10}{largesymbols}{35}
\DeclareMathDelimiter{\lvvert}     {\mathopen} {symbols}     {10}{largesymbols}{35}
\DeclareMathDelimiter{\rvvert}     {\mathclose}{symbols}     {10}{largesymbols}{35}
```

Slot 36 is the lowered textstyle square root sign. There should be at least four additional sizes of big radicals for compatibility with `cmsy` and `cmex`. (This is different from the delimiters where the textstyle version resides in MC and MXP only includes the four bigger sizes. For the radicals the MXP encoding should provide the textstyle version as well.)

```
\DeclareMathSymbol{\s@rd}     {\mathop} {largesymbols}{36}
\DeclareMathRadical{\sqrtsign}          {largesymbols}{36}{largesymbols}{36}
```

Slots 21, 29, 37 contain the building blocks for the extensible radical sign, which is accessed only indicrectly.

Slots 22–23, 30–31 and 38–39 contain the building blocks for vertical extensible arrows and are simultaneously used as the entry points to access the various combinations. Slots 78–79, which are otherwise empty at present, are (ab)used as the entry points for the extensible version of the arrow extension modules. This approach seemed cleaner than putting the entry points to access the arrow extension modules into some other slots unrelated to the arrows.

```
\DeclareMathDelimiter{\uparrow}    {\mathrel}  {letters}    {222}{largesymbols}{22}
\DeclareMathDelimiter{\Uparrow}    {\mathrel}  {letters}    {223}{largesymbols}{23}
\DeclareMathDelimiter{\updownarrow}{\mathrel}  {letters}    {238}{largesymbols}{30}
\DeclareMathDelimiter{\Updownarrow}{\mathrel}  {letters}    {239}{largesymbols}{31}
\DeclareMathDelimiter{\downarrow}  {\mathrel}  {letters}    {230}{largesymbols}{38}
\DeclareMathDelimiter{\Downarrow}  {\mathrel}  {letters}    {231}{largesymbols}{39}
\DeclareMathDelimiter{\arrowvert}  {\mathord}  {symbols}      {8}{largesymbols}{78}
\DeclareMathDelimiter{\Arrowvert}  {\mathord}  {symbols}      {9}{largesymbols}{79}
```

Slots 40–63 and 70–71 contain the building blocks for extensible delimiters (square brackets, semantic brackets = double square bracekts, parens, and curly braces).

Slots 40–47 are the entry points for the extensible versions of the big delimiters in slots 0–7. Slots 48–49 and 56–57 are the entry points for floor and ceiling brackets. Slots 50–51 and 58–59 could be used in a similar way to build semantic floor and ceiling brackets, but no corresponding delimiters exists in smaller sizes.

Some of the remaining slots are used to define additional operators. The allocation for `\bracevert` is arbitrary, since we have to assume a symmetric construction anyway for the moustache bracekts.

```
\DeclareMathDelimiter{\bracevert}  {\mathord}  {largesymbols}{54}{largesymbols}{54}
\DeclareMathDelimiter{\lbracevert} {\mathopen} {largesymbols}{54}{largesymbols}{54}
\DeclareMathDelimiter{\rbracevert} {\mathclose}{largesymbols}{55}{largesymbols}{55}
\DeclareMathDelimiter{\lmoustache} {\mathopen} {symbols}      {6}{largesymbols}{62}
\DeclareMathDelimiter{\rmoustache} {\mathclose}{symbols}      {7}{largesymbols}{63}
\DeclareMathDelimiter{\lgroup}     {\mathopen} {symbols}      {4}{largesymbols}{70}
\DeclareMathDelimiter{\rgroup}     {\mathclose}{symbols}      {5}{largesymbols}{71}
```

Slots 64–69, 72–77, 80–103 contain the big operators, usually arranged in two rows with and offset of 8 slots between textstyle and displaystyle operators.

Note: It was pointed out at the Math Font BOF at EuroTeX'98 that Russian typography traditionally requires much bigger sizes for displaystyle operators. While the Mathematica font sets do provide three sizes of operators instead of two, TeX itself only supports a distinction between textstyle and displaystyle, and that's all.

```
\DeclareMathSymbol{\sum}      {\mathop} {largesymbols}{64}
\DeclareMathSymbol{\prod}     {\mathop} {largesymbols}{65}
\DeclareMathSymbol{\coprod}   {\mathop} {largesymbols}{66}
\DeclareMathSymbol{\bigodot}  {\mathop} {largesymbols}{67}
\DeclareMathSymbol{\bigoplus} {\mathop} {largesymbols}{68}
\DeclareMathSymbol{\bigotimes}{\mathop} {largesymbols}{69}
\DeclareMathSymbol{\intop}    {\mathop} {largesymbols}{80}
\DeclareMathSymbol{\iintop}   {\mathop} {largesymbols}{81}
\DeclareMathSymbol{\iiintop}  {\mathop} {largesymbols}{82}
\DeclareMathSymbol{\ointop}   {\mathop} {largesymbols}{83}
\DeclareMathSymbol{\oiintop}  {\mathop} {largesymbols}{84}
\DeclareMathSymbol{\bigcup}   {\mathop} {largesymbols}{85}
\DeclareMathSymbol{\bigcap}   {\mathop} {largesymbols}{86}
\DeclareMathSymbol{\biguplus} {\mathop} {largesymbols}{87}
\DeclareMathSymbol{\bigvee}   {\mathop} {largesymbols}{96}
\DeclareMathSymbol{\bigwedge} {\mathop} {largesymbols}{97}
\DeclareMathSymbol{\bigsqcup} {\mathop} {largesymbols}{98}
\DeclareMathSymbol{\bigsqcap} {\mathop} {largesymbols}{99}
```

Here we define some related compound symbols.

```
\DeclareCompoundMathSymbol{\int}  {\mathop} {\intop\nolimits}
\DeclareCompoundMathSymbol{\iint} {\mathop} {\iintop\nolimits}
\DeclareCompoundMathSymbol{\iiint}{\mathop} {\iiintop\nolimits}
\DeclareCompoundMathSymbol{\oint} {\mathop} {\ointop\nolimits}
\DeclareCompoundMathSymbol{\oiint}{\mathop} {\oiintop\nolimits}
\DeclareCompoundMathSymbol{\surd} {\mathord}{\s@rd}
```

Slots 104–126 and 128–255 are a variable area, which is accessed only indirectly. In the present implementation, slots 104–111, 112–119, and 120–126 provide room for up to eight sizes each for two kinds of wide accents and up to seven sizes of big radicals. Finally, slots 128–255 are fully reserved for big delimiters.

This completes the declaration for the fixed area of the MXP encoding, and now for something completely different . . .

There are some macros for horizontally extensible things.

```
\def\braceexwd{2mu}

\def\bracefill#1#2#3#4{$\m@th#1#4\mkern-\braceexwd
  \cleaders\hbox{$#4$}\hfill\mkern-\braceexwd#4#2#4\mkern-\braceexwd
  \cleaders\hbox{$#4$}\hfill\mkern-\braceexwd#4#3$}

\def\rightarrowfill{$\m@th\smash\relbar\mkern-7mu%
  \cleaders\hbox{$\mkern-2mu\smash\relbar\mkern-2mu$}\hfill
  \mkern-7mu\mathord\rightarrow$}

\def\leftarrowfill{$\m@th\mathord\leftarrow\mkern-7mu%
  \cleaders\hbox{$\mkern-2mu\smash\relbar\mkern-2mu$}\hfill
  \mkern-7mu\smash\relbar$}
```

The following macros place arrows and braces over or under formulas. The kern values in the `\over`- and `\underbrace@` macros might need some tweaking.

```
\def\overbrace@#1#2{\mathop{\vbox{\m@th\ialign{##\crcr\noalign{\kern0\p@}%
      #1\crcr\noalign{\kern0\p@\nointerlineskip}%
      $\hfil\displaystyle{#2}\hfil$\crcr}}\limits}

\def\underbrace@#1#2{\mathop{\vtop{\m@th\ialign{##\crcr
   $\hfil\displaystyle{#2}\hfil$\crcr
   \noalign{\kern0\p@\nointerlineskip}%
   #1\crcr\noalign{\kern0\p@}}}}\limits}

\def\overarrow@#1#2{\vbox{\m@th\ialign{##\crcr
      #1\crcr\noalign{\kern-\p@\nointerlineskip}%
      $\hfil\displaystyle{#2}\hfil$\crcr}}}
```

These are the user-level macros.

`\overbrace`
`\underbrace`

```
\def\overbrace{\overbrace@{\bracefill\braceld\bracemd\bracerd\bracexd}}
\def\underbrace{\underbrace@{\bracefill\bracelu\bracemu\braceru\bracexu}}
```

`\overrightarrow`
`\overleftarrow`

```
\def\overrightarrow{\overarrow@\rightarrowfill}
\def\overleftarrow{\overarrow@\leftarrowfill}
```

Some further possibilities, perhaps of little interest.

UV: Keep in mind that the MMa font sets alos provide additional over- and under delimiters for parens, brackets and angles, which we haven't included in our encodings at all, yet. These usually come in four different widths and an extensible version where possible. (Mathematica seems to have a horizontal counterpart of vertical extensible delimiters, which TeX doesn't have.)

`\overgroup`
`\undergroup`

```
\def\overgroup{\overbrace@{\bracefill\braceld{}\bracerd\bracexd}}
\def\undergroup{\underbrace@{\bracefill\bracelu{}\braceru\bracexu}}
```

4.2 Misc setup

The usual way to access bigger variants of delimiters.

UV: Actually, these values may have to be checked w.r.t. `\delimiterfactor` and such. The values below are fine if you assume a *math_axis* at 2.5 pt and delimiters provided in sizes 12 pt, 18 pt, 24 pt and 30 pt. In general, the height of the vboxes should be chosen so that $2(h_{\mathrm{vbox}} - h_{\mathrm{axis}}) = h_{\mathrm{delim}}$.

On the other hand, the use of the `exscale` option might make these assignments redundant anyway.

```
\def\big#1{{\hbox{$\left#1\vbox to8.5\p@{}\right.\n@space$}}}
\def\Big#1{{\hbox{$\left#1\vbox to11.5\p@{}\right.\n@space$}}}
\def\bigg#1{{\hbox{$\left#1\vbox to14.5\p@{}\right.\n@space$}}}
\def\Bigg#1{{\hbox{$\left#1\vbox to17.5\p@{}\right.\n@space$}}}
\def\n@space{\nulldelimiterspace\z@ \m@th}
```

Misc math constructs.

UV: These raise and kern values might depend on the font. Also note that `mathtime.sty` uses `\hb@xmdot` here, which is defined as `\hbox{$\m@th.$}` instead of `\hbox{.}`, to ensure that a dot with math spacing is used.

```
\def\mathellipsis{\mathinner{\ldotp\ldotp\ldotp}}%
\def\cdots{\mathinner{\cdotp\cdotp\cdotp}}
\def\vdots{\vbox{\baselineskip4\p@ \lineskiplimit\z@
    \kern6\p@\hbox{.}\hbox{.}\hbox{.}}}
\def\ddots{\mathinner{\mkern1mu\raise7\p@
    \vbox{\kern7\p@\hbox{.}}\mkern2mu
    \raise4\p@\hbox{.}\mkern2mu\raise\p@\hbox{.}\mkern1mu}}
\def\mathunderscore{\kern.06em\vbox{\hrule\@width.3em}}
```

4.2.1 Aliases

Some symbols have traditionally more than one name. We have to keep these names for backward compatibility.

UV: One might easily invent more alias names, e.g. `\lsim` and `\gsim` for `\lessim` and `\gtrsim`. In fact, I saw them as constructed symbols in some journal publisher's macro package.

```
\let\Join\bowtie
\let\lnot\neg
\let\land\wedge
\let\lor\vee
\let\le\leq
\let\ge\geq
\let\ne\neq
\let\llless\lll
\let\gggtr\ggg
\let\Box\square
\let\thicksim\sim
\let\thickapprox\approx
\let\gets\leftarrow
\let\to\rightarrow
\let\owns\ni
```

4.2.2 Greek setup

\othergreek

The macro \othergreek toggles between italic and upright greek.

```
\newcommand{\othergreek}[1]{\@GREEK#1}
```

We set up the greek macros so that capital greek letters are upright while lowercase greek letters are italic by default.

Note: It is difficult to say, which kind of naming scheme is better. Daniel Taupin's new ec-plain package defines \rmGamma, \slGamma, \upGamma instead of \Gammaup or \Gammait.

OTOH, the mathtime and lucidabr packages, define \varGamma for the italic version (assumming \Gamma for the upright versions), but that is certainly problematic if we introduce variants of the uppercase Greek \Upsilon and \Chi.

```
\let\Alpha\Alphaup
\let\Beta\Betaup
\let\Gamma\Gammaup
\let\Delta\Deltaup
\let\Epsilon\Epsilonup
\let\Zeta\Zetaup
\let\Eta\Etaup
\let\Theta\Thetaup
\let\Iota\Iotaup
\let\Kappa\Kappaup
\let\Lambda\Lambdaup
\let\Mu\Muup
\let\Nu\Nuup
\let\Xi\Xiup
\let\Omikron\Omikronup
\let\Pi\Piup
\let\Rho\Rhoup
\let\Sigma\Sigmaup
\let\Tau\Tauup
\let\Upsilon\Upsilonup
\let\Phi\Phiup
\let\Chi\Chiup
\let\Psi\Psiup
\let\Omega\Omegaup

\let\alpha\alphait
\let\beta\betait
\let\gamma\gammait
\let\delta\deltait
\let\epsilon\epsilonit
\let\zeta\zetait
\let\eta\etait
\let\theta\thetait
\let\iota\iotait
\let\kappa\kappait
\let\lambda\lambdait
\let\mu\muit
\let\nu\nuit
\let\xi\xiit
\let\omikron\omikronit
```

```
\let\pi\piit
\let\rho\rhoit
\let\sigma\sigmait
\let\tau\tauit
\let\upsilon\upsilonit
\let\phi\phiit
\let\chi\chiit
\let\psi\psiit
\let\omega\omegait

\let\varepsilon\varepsilonit
\let\vartheta\varthetait
\let\varkappa\varkappait
\let\varpi\varpiit
\let\varrho\varrhoit
\let\varsigma\varsigmait
\let\varphi\varphiit
\let\varUpsilon\varUpsilonup
\let\varChi\varChiup
\let\partial\partialit
\let\lambdabar\lambdabarit
⟨/cfg⟩
```

5 The newmath package

This package can be used with a LaTeX kernel containing the new math setup or with a standard LaTeX kernel. In the latter case, we load the cfg file now, after resetting pieces of the old setup that would break the cfg file.

```
⟨*newmath⟩
\ifx\M@layout\@undefined
  \InputIfFileExists{fontmath.cfg}{
\let\underbar\relax
\let\Hat\relax
\let\Check\relax
\let\Tilde\relax
\let\Acute\relax
\let\Grave\relax
\let\Dot\relax
\let\Ddot\relax
\let\Breve\relax
\let\Bar\relax
\let\rightleftharpoons\relax
\let\bowtie\relax
\let\relbar\relax
\let\Relbar\relax
\let\angle\relax
\let\doteq\relax
\let\cong\relax
\let\notin\relax
\let\models\relax
\let\colon\relax
\let\prime\relax
\let\dddot\relax
```

```
\let\ddddot\relax
\let\bigcup\relax
\let\bigcap\relax
\let\biguplus\relax
\let\bigwedge\relax
\let\bigvee\relax
\let\bigsqcup\relax
\let\bigodot\relax
\let\bigoplus\relax
\let\bigotimes\relax
\let\sum\relax
\let\prod\relax
\let\coprod\relax}
    {\PackageError{newmath}
                  {New math setup required}
                  {Your LaTeX kernel does not have the new math setup
                   built in\MessageBreak and no fontmath.cfg file was found.}}
  \ifx\M@layout\@undefined
    \PackageError{newmath}
                 {New math setup required}
                 {The fontmath.cfg file did not provide the new math setup.}
  \fi
\fi
```

5.1 Advanced accents

The accent-specific code is singled out in the `accents` option. It defines a macro `\DeclareMathAccents` which we use to declare four variants of each accent: The normal accent, a nestable version (like the capital accent macros from `amssymb`), an under accent and a nestable version of that.

The code in this part is rather messy and not completely understood by its author, so expect bugs.

```
\DeclareOption{accents}{

\AtEndOfPackage{\RequirePackage{calc}}

\newdimen\ACC@sep
\newdimen\ACC@ht
\newdimen\ACC@skew

\newdimen\ACC@dimen
\newmuskip\ACC@mu

\newcount\ACC@tok
\newcount\ACC@class
\newcount\ACC@fam
\newcount\ACC@@fam
\newcount\ACC@skch

\let\ACC@style\relax
\let\ACC@font\relax
\let\ACC@under\relax
\let\ACC@over\relax
```

```
\def\ACC@hide{%
  \global\let\ACC@over\relax
  \global\let\ACC@under\relax
  \global\ACC@ht\z@
  \global\ACC@skew\z@
  \global\ACC@dimen\z@}
```

Since we do under accents manually, we have to take care to use the right style and font. This is achieved by the following macro. Its first and third argument are ⟨*accent*⟩ and ⟨*accentee*⟩, the second argument should be '`t`', if inner accents are to be ignored.

```
\def\ACC@placeunder#1#2#3{\begingroup
  \ifx\ACC@style\relax
   \mathchoice{%
      \let\ACC@style\displaystyle
      \let\ACC@font\textfont
      \ACC@@placeunder{#1}{#2}{#3}%
     }{%
      \let\ACC@style\textstyle
      \let\ACC@font\textfont
      \ACC@@placeunder{#1}{#2}{#3}%
     }{%
      \let\ACC@style\scriptstyle
      \let\ACC@font\scriptfont
      \ACC@@placeunder{#1}{#2}{#3}%
     }{%
      \let\ACC@style\scriptscriptstyle
      \let\ACC@font\scriptscriptfont
      \ACC@@placeunder{#1}{#2}{#3}%
     }%
  \else
    \ACC@@placeunder{#1}{#2}{#3}%
  \fi
  \endgroup}
```

The follwing macro is doing the main work of underaccent placement.

```
\def\ACC@@placeunder#1#2#3{%
```

First we need to save the current `\mathgroup`, since we will need it later on.

```
  \ACC@fam\the\mathgroup
  \ACC@@fam\the\mathgroup
```

We set the accentee in a box to get information about inner accents and about the innermost accentee. If the second argument is 't', we pretend that there is no inner accent. This will force the centering of the accent over the accentee.

```
  \ACC@hide
  \setbox\tw@\hbox{\ACC@unbrace$\m@th\ACC@style\ACC@restorefam#3$}%
  \if#2t
     \global\let\ACC@under\relax
     \global\ACC@ht\z@
     \global\ACC@skew\z@
     \global\ACC@dimen\z@
  \fi
```

The code for over and under accents needs to know the innermost accentee for the calculation of the proper skew. Therefore we store this information in the macros `\ACC@under` and `\ACC@over`.

```
\ifx\ACC@under\relax
   \gdef\ACC@under{#3}%
   \ifx\ACC@over\relax
      \gdef\ACC@over{#3}%
   \fi
\fi
```

For underaccents we have to distinguish the cases where we should center the accent and the cases where a proper skew should be calculated. The current implementation doesn't try to find out the proper skew unless the accentee is a single token.

```
\ifdim\ACC@ht=\z@
   \ACC@counttok{\ACC@under}%
\else
   \ACC@tok\tw@
\fi
```

To calculate the proper skew, we need information about the mathcode of the accentee. We need the class and family.

```
\ACC@fam\m@ne
\ACC@class\m@ne
\ifnum\ACC@tok=\@ne
   \ACC@classfam{\ACC@under}%
\fi
```

If the accentee doesn't have a mathcode, we have to find out the correct family value from the environment (use 2 as fallback value).

```
\ifnum\ACC@class=\m@ne
   \ACC@fam\tw@
   \ACC@getfam
```

...while we may have to correct the family value for `\mathalpha` tokens.

```
\else
   \ifnum\ACC@class=7\relax
      \ACC@getfam
   \fi
\fi
```

Now we are prepared to calculate the skew. `\accenteeskew@` is zero at this point, so we only have to do something for the case where we might need a nonzero skew, i.e. if the accentee is a single token.

For single tokens, the skew is stored in the ⟨*skewchar*⟩–⟨*accentee*⟩ kerning.

```
\ifnum\ACC@tok=\@ne
  \ACC@getskch
  \setbox\z@\hbox{\ACC@unbrace$\m@th\ACC@style\ACC@restorefam
                  \ACC@skewchar\hbox{}\ACC@under$}%
  \setbox\@ne\hbox{\ACC@unbrace$\m@th\ACC@style\ACC@restorefam
                   \ACC@skewchar\ACC@under$}%
  \global\ACC@skew\the\wd\@ne
  \global\advance\ACC@skew-\wd\z@
\fi
```

We need two more pieces of information to place the accent correctly, namely the amount of space to put between the accentee and the accent and the height of the accent (over the x-height of its font).

The separation is stored as ⟨*accent*⟩–⟨*accent*⟩ kerning. If this kern is zero, we assume that the font is not prepared for underaccent positioning and use a default value.

```
  \setbox\z@\hbox{$\m@th\ACC@style\ACC@@restorefam#1\hbox{}#1$}%
  \setbox\@ne\hbox{$\m@th\ACC@style\ACC@@restorefam#1#1$}%
  \ACC@sep\the\wd\@ne
  \advance\ACC@sep-\wd\z@
  \ifdim\ACC@sep=\z@ \ACC@sep=.2\fontdimen5\ACC@font\tw@ \fi
  \global\ACC@ht\the\ht\z@
  \advance\ACC@ht-\ACC@xheight%
```

Now we can finally place the accent under the accentee. We avoid setting the accentee again, since it might be a complicated constuction.

```
  \mathord{\o@lign{\usebox\tw@
         \crcr\noalign{\nointerlineskip}%
         \hidewidth\vbox to\ACC@ht{%
            \vskip\ACC@sep
            \hbox{$\m@th\ACC@style\ACC@@restorefam#1$}\vss}%
         \hskip\tw@\ACC@skew\hidewidth}}}
```

The following are a bunch of auxiliary macros used in `\placeunderaccent@@`.

```
\def\ACC@getfam{\ifnum\mathgroup=\m@ne\else\ACC@fam\the\mathgroup\fi}
\def\ACC@restorefam{\mathgroup\ACC@fam\relax}
\def\ACC@@restorefam{\mathgroup\ACC@@fam\relax}

\edef\ACC@mch{\meaning\mathchar}
\def\ACC@@classfam#1"#2"#3\@nil#4{%
  \xdef\meaning@{#1}%
  \edef\ACC@@@@classfam{\noexpand\ACC@@@classfam{#4}}%
  \ifx\meaning@\ACC@mch\@tempcnta"#2\relax\else\ACC@@@@classfam\fi}
\def\ACC@@@classfam#1{%
  \ifcat.\ifcat a#1.\else#1\fi\@tempcnta\mathcode`#1\relax
  \ifnum\@tempcnta=\mathcode`\'\@tempcnta\m@ne\fi\else\@tempcnta\m@ne\fi}
```

Set `\ACC@fam` and `\ACC@class` to the class and family of `#1`, if it has a mathcode, else dont touch `\ACC@fam` and set `\ACC@class` to -1.

```
\def\ACC@classfam#1{%
  \edef\meaning@{\expandafter\meaning#1}%
  \expandafter\ACC@@classfam\meaning@""\@nil#1
  \ifnum\@tempcnta=\m@ne
     \global\ACC@class\m@ne
  \else
    \@tempcntb\@tempcnta
    \divide\@tempcntb"1000%
    \ACC@class\@tempcntb
    \multiply\@tempcntb"1000%
    \advance\@tempcntb-\@tempcnta
    \divide\@tempcntb-"100%
    \ACC@fam\@tempcntb
  \fi}
```

Token counting This is the most messy stuff of all this. It is certainly wrong. But I can't figure out a different way to find out if `\mathaccent` would treat `#1` as a single token or not.

Return 0, 1 or 2 as the value of `\count@` if the expansion of `#1` consists of zero, one or more tokens respectively.

```
\def\ACC@counttok#1{%
  \begingroup
     \let\ACC@counttok\iffalse
     \expandafter\ACC@@counttok#1\@@nil\@@nil\fi
  \endgroup}

\def\ACC@@counttok#1#2{%
  \ifx#1\@@nil \global\ACC@tok\z@
  \else \ifx#2\@@nil \global\ACC@tok\@ne\else \global\ACC@tok\tw@\fi
  \fi
  \iffalse}
```

`\ACC@font` is one of `\textfont`, `\scriptfont` or `\scriptscriptfont`.

```
\def\ACC@xheight{\fontdimen5\the\ACC@font\ACC@fam}
```

This (like so much more) is stolen from `amsmath.sty`.

```
\def\ACC@getskch{%
  \ACC@skch\the\skewchar\textfont2\relax
  \ifnum\mathgroup>\m@ne
     \ifnum\mathgroup<16
        \ACC@skch\the\skewchar\textfont\ACC@fam\relax
     \fi
  \fi
  \ifnum\ACC@skch>\m@ne
     \ifnum\ACC@skch<128
        \count@\ACC@fam
        \multiply\count@256\relax
        \advance\ACC@skch\count@\relax
        \advance\ACC@skch28672\relax
     \else
        \ACC@skch\m@ne
     \fi
  \else
     \ACC@skch\m@ne
  \fi}

\def\ACC@skewchar{%
  \ifnum\ACC@skch=\m@ne
  \else
     \expandafter\mathchar\the\ACC@skch
  \fi}

\def\ACC@unbrace{\let\math@bgroup\@empty\let\math@egroup\@empty}
```

The macro `\ACC@pttomu` is different from `\dimentomu@` in `amsmath.sty`: it uses the `calc` package and tries to preserve fractional `mu` units. For this reason we use a `\muskip` register instead of a `\count` register.

```
\def\ACC@pttomu{%
```

```
\setlength{\@tempdima}{18pt*\ratio{\ACC@dimen}{\fontdimen6\textfont2}}%
\expandafter\global\expandafter\ACC@mu\strip@pt\@tempdima mu}
```

Now for something completely different (and much easier): Nestable over accents.

```
\def\ACC@placeover#1#2#3{%
```

We start as in `\ACC@@placeunder`. The family is needed later on.

```
\ACC@fam\tw@ \ACC@getfam
```

Then we set the accentee in a box to get information about inner accents and about the innermost accentee.

```
\ACC@hide
\setbox\z@\hbox{\ACC@unbrace$\m@th\ACC@restorefam\relax#3$}%
\ifx#2t\global\let\ACC@over\relax\fi
```

If there was no inner over accent, we can simply use the primitive, since it will do proper skewing.

```
\ifx\ACC@over\relax
   \gdef\ACC@over{#3}%
   \ifx\ACC@under\relax
      \gdef\ACC@under{#3}%
   \fi
   \mathaccent#1{#3}%
```

If there was an inner over accent, we use the saved innermost accentee to calculate the appropriate skew.

```
\else
     \ACC@getskch
     \setbox\@ne\hbox{\ACC@unbrace$\m@th\ACC@restorefam\relax
                      \ACC@over\ACC@skewchar$}%
     \setbox\tw@\hbox{\ACC@unbrace$\m@th\ACC@restorefam\relax
                      \ACC@over\hbox{}\ACC@skewchar$}%
     \global\ACC@dimen\wd\@ne
     \global\advance\ACC@dimen-\wd\tw@
     \global\multiply\ACC@dimen\tw@
     \ACC@pttomu
```

The skew is used to shift the accentee in the correct position under the accent.

```
     {\mathaccent#1{#3\mkern\ACC@mu}\mkern-\ACC@mu}{}%
\fi}
```

We want to steal the code from `\DeclareMathAccent` for the declaration of nestable and under accents. For that reason, we define some replacements for `\set@mathaccent`.

```
\def\set@underaccent@nesting#1#2#3#4{%
\ifx#3\mathalpha
\xdef#2{\noexpand\ACC@placeunder{%
          \mathchar"\noexpand\accentclass@\hexnumber@#1#4}{f}}%
\else
\xdef#2{\noexpand\ACC@placeunder{%
          \mathchar"\mathchar@type#3\hexnumber@#1#4}{f}}%
\fi}

```

```
\def\set@underaccent#1#2#3#4{%
 \ifx#3\mathalpha
 \xdef#2{\noexpand\ACC@placeunder{%
          \mathchar"\noexpand\accentclass@\hexnumber@#1#4}{t}}%
 \else
 \xdef#2{\noexpand\ACC@placeunder{%
          \mathchar"\mathchar@type#3\hexnumber@#1#4}{t}}%
 \fi}

\def\set@mathaccent@#1#2#3#4{%
 \ifx#3\mathalpha
   \xdef#2{\noexpand\ACC@placeover{%
             "\noexpand\accentclass@\hexnumber@#1#4}{t}}%
 \else
   \xdef#2{\noexpand\ACC@placeover{%
             "\mathchar@type#3\hexnumber@#1#4}{t}}%
 \fi}

\def\set@mathaccent@nesting#1#2#3#4{%
 \ifx#3\mathalpha
   \xdef#2{\noexpand\ACC@placeover{%
             "\noexpand\accentclass@\hexnumber@#1#4}{f}}%
 \else
   \xdef#2{\noexpand\ACC@placeover{%
             "\mathchar@type#3\hexnumber@#1#4}{f}}%
 \fi}
```

Here are the four variants of \DeclareMathAccent.

```
\let\@@DeclareMathAccent\DeclareMathAccent

\def\DeclareMathAccent#1#2#3#4{%
  \begingroup
    \let\set@mathaccent\set@mathaccent@
    \@@DeclareMathAccent{#1}{#2}{#3}{#4}
  \endgroup}

\def\DeclareMathNestableAccent#1#2#3#4{
  \begingroup
    \let\set@mathaccent\set@mathaccent@nesting
    \@@DeclareMathAccent{#1}{#2}{#3}{#4}
  \endgroup}

\def\DeclareMathUnderAccent#1#2#3#4{%
  \begingroup
    \let\set@mathaccent\set@underaccent
    \@@DeclareMathAccent{#1}{#2}{#3}{#4}
  \endgroup}

\def\DeclareMathNestableUnderAccent#1#2#3#4{%
  \begingroup
    \let\set@mathaccent\set@underaccent@nesting
    \@@DeclareMathAccent{#1}{#2}{#3}{#4}
  \endgroup}
```

We also provide a macro which can be used to define all four variants in one go: \DeclareMathAccents.

This defines four accents:

- #1 and #2 are over accents
- #3 and #4 are under accents
- #2 and #4 are 'nestable' (like $\mathcal{AMS}$ \Hat and friends), they skew over/under single tokens, align to inner accents and center otherwise.
- #1 and #3 ignore inner accents (like plain \hat and friends), they skew over/under single tokens and center otherwise.

```
\def\DeclareMathAccents#1#2#3#4#5#6#7{
  \DeclareMathAccent              {#1}{#5}{#6}{#7}
  \DeclareMathNestableAccent      {#2}{#5}{#6}{#7}
  \DeclareMathUnderAccent         {#3}{#5}{#6}{#7}
  \DeclareMathNestableUnderAccent{#4}{#5}{#6}{#7}}
```

Most macros from this file are not needed in the document body, so we can make them preamble-only.

```
\@onlypreamble\set@mathaccent@
\@onlypreamble\set@mathaccent@nesting
\@onlypreamble\set@underaccent
\@onlypreamble\set@underaccent@nesting
\@onlypreamble\@@DeclareMathAccent
\@onlypreamble\DeclareMathAccent
\@onlypreamble\DeclareMathNestableAccent
\@onlypreamble\DeclareMathUnderAccent
\@onlypreamble\DeclareMathNestableUnderAccent
\@onlypreamble\DeclareMathAccents
```

Now we declare the accents using \DeclareMathAccents. The T1 accents are declared as \mathalpha, the others as \mathord.

```
\DeclareMathAccents{\grave}{\Grave}{\ugrave}{\uGrave}{\mathalpha}{letters} {0}
\DeclareMathAccents{\acute}{\Acute}{\uacute}{\uAcute}{\mathalpha}{letters} {1}
\DeclareMathAccents{\hat}  {\Hat}  {\uhat}  {\uHat}  {\mathalpha}{letters} {2}
\DeclareMathAccents{\tilde}{\Tilde}{\utilde}{\uTilde}{\mathalpha}{letters} {3}
\DeclareMathAccents{\ddot} {\Ddot} {\uddot} {\uDdot} {\mathalpha}{letters} {4}
\DeclareMathAccents{\arc}  {\Arc}  {\uarc}  {\uArc}  {\mathord}  {letters} {5}
\DeclareMathAccents{\ring} {\Ring} {\uring} {\uRing} {\mathalpha}{letters} {6}
\DeclareMathAccents{\check}{\Check}{\ucheck}{\uCheck}{\mathalpha}{letters} {7}
\DeclareMathAccents{\breve}{\Breve}{\ubreve}{\uBreve}{\mathalpha}{letters} {8}
\DeclareMathAccents{\bar}  {\Bar}  {\ubar}  {\uBar}  {\mathalpha}{letters} {9}
\DeclareMathAccents{\dot}  {\Dot}  {\udot}  {\uDot}  {\mathalpha}{letters}{10}
\DeclareMathAccents{\dddot}{\Dddot}{\udddot}{\uDddot}{\mathord}  {letters}{11}
\DeclareMathAccents{\ddddot}{\Ddddot}{\uddddot}{\uDdddot}{\mathord}{letters}{12}
\DeclareMathAccents{\vec}  {\Vec}  {\uvec}  {\uVec}  {\mathord}  {letters}{13}
\DeclareMathAccents{\rvec} {\Rvec} {\urvec} {\uRvec} {\mathord}  {letters}{14}
\DeclareMathAccents{\dvec} {\Dvec} {\udvec} {\uDvec} {\mathord}  {letters}{15}
\DeclareMathAccents{\upbrack}{\Upbrack}{\uupbrack}{\uUpbrack}{\mathord}{letters}{16}
\DeclareMathAccents{\downbrack}{\Downbrack}{\udownbrack}{\uDownbrack}{\mathord}{letters}{17}
\DeclareMathAccents{\graveinv}{\Graveinv}{\ugraveinv}{\uGraveinv}{\mathord}{letters}{27}
\DeclareMathAccents{\acuteinv}{\Acuteinv}{\uacuteinv}{\uAcuteinv}{\mathord}{letters}{28}
} % \DeclareOption{accents}
```

5.2 AMSLaTeX math

We provide an `amssymb` option which gives some kind of compatibility with the `amssymb` package. Note that many `amssymb` symbols are now already part of the plain LaTeX setup in the previous section.

```
\DeclareOption{amssymb}{
```

5.2.1 NFSS declarations

```
\DeclareFontEncoding{MS1}{}{\noaccents@}
\DeclareFontEncoding{MS2}{}{\noaccents@}

\DeclareFontSubstitution{MS1}{cm}{m}{n}
\DeclareFontSubstitution{MS2}{cm}{m}{n}

\DeclareSymbolFont{symbolsb}{MS1}{cm}{m}{n}
\DeclareSymbolFont{symbolsc}{MS2}{cm}{m}{n}

\SetSymbolFont{symbolsb}{bold}{MS1}{cm}{b}{n}
\SetSymbolFont{symbolsc}{bold}{MS2}{cm}{b}{n}

\DeclareSymbolFontAlphabet{\mathbb}  {symbolsb}
\DeclareSymbolFontAlphabet{\mathfrak}{symbolsc}
```

We have to revert some definitions from `amssymb` in case it is loaded.

```
\let\leftleftarrows\relax
\let\rightrightarrows\relax
\let\leftrightarrows\relax
\let\rightleftarrows\relax
\let\twoheadleftarrow\relax
\let\twoheadrightarrow\relax
\let\Lleftarrow\relax
\let\Rrightarrow\relax
\let\leftarrowtail\relax
\let\rightarrowtail\relax
\let\looparrowleft\relax
\let\looparrowright\relax
\let\leftrightharpoons\relax
\let\rightleftharpoons\relax
\let\multimap\relax
\let\rightsquigarrow\relax
\let\leftsquigarrow\relax
\let\leftrightsquigarrow\relax
\let\nleftarrow\relax
\let\nrightarrow\relax
\let\nleftrightarrow\relax
\let\nLeftarrow\relax
\let\nRightarrow\relax
\let\nLeftrightarrow\relax
\let\checkmark\relax
\let\dashleftarrow\relax
\let\dashrightarrow\relax

\symbol@gone\yen
```

```
\symbol@gone\maltese
\symbol@gone\circledR
\symbol@gone\circledS
```

5.2.2 The MS1 encoding

Slots 0–24 and 27–31 are empty, slots 25 and 26 are the blackboard bold dotless i and j. Slot 32 is the space.

```
\DeclareMathSymbol{\circleddash}      {\mathbin}{symbolsb}{33}
\DeclareMathSymbol{\circledast}       {\mathbin}{symbolsb}{34}
\DeclareMathSymbol{\circledcirc}      {\mathbin}{symbolsb}{35}
\DeclareMathSymbol{\circlearrowleft}  {\mathrel}{symbolsb}{36}
\DeclareMathSymbol{\circlearrowright}{\mathrel}{symbolsb}{37}
\DeclareMathSymbol{\curvearrowleft}   {\mathrel}{symbolsb}{38}
\DeclareMathSymbol{\curvearrowright}  {\mathrel}{symbolsb}{39}
\DeclareMathSymbol{\upuparrows}       {\mathrel}{symbolsb}{40}
\DeclareMathSymbol{\downdownarrows}   {\mathrel}{symbolsb}{41}
\DeclareMathSymbol{\upharpoonright}   {\mathrel}{symbolsb}{42}
\DeclareMathSymbol{\downharpoonright}{\mathrel}{symbolsb}{43}
\DeclareMathSymbol{\upharpoonleft}    {\mathrel}{symbolsb}{44}
\DeclareMathSymbol{\downharpoonleft}  {\mathrel}{symbolsb}{45}
\DeclareMathSymbol{\Lsh}              {\mathrel}{symbolsb}{46}
\DeclareMathSymbol{\Rsh}              {\mathrel}{symbolsb}{47}
```

Slots 48–57 are the blackboard bold digits.

```
\DeclareMathDelimiter{\llcorner}    {\mathopen} {symbolsb}{58}{symbolsb}{58}
\DeclareMathDelimiter{\lrcorner}    {\mathclose}{symbolsb}{59}{symbolsb}{59}
\DeclareMathDelimiter{\ulcorner}    {\mathopen} {symbolsb}{60}{symbolsb}{60}
\DeclareMathDelimiter{\urcorner}    {\mathclose}{symbolsb}{61}{symbolsb}{61}

\DeclareMathSymbol{\leftthreetimes} {\mathbin}  {symbolsb}{62}
\DeclareMathSymbol{\rightthreetimes}{\mathbin}  {symbolsb}{63}
```

Slots 65–90 are the blackboard bold uppercase alphabet, slots 97–122 are the blackboard bold lowercase alphabet. Slots 64 and 91–96 are empty.

```
\DeclareMathSymbol{\Bbbk}              {\mathord}{symbolsb}{107}
```

Slot 127 is the `\skewchar`.

```
\DeclareMathSymbol{\eqslantless}       {\mathrel}{symbolsb}{128}
\DeclareMathSymbol{\eqslantgtr}        {\mathrel}{symbolsb}{129}
\DeclareMathSymbol{\lnsim}             {\mathrel}{symbolsb}{130}
\DeclareMathSymbol{\gnsim}             {\mathrel}{symbolsb}{131}
\DeclareMathSymbol{\lessapprox}        {\mathrel}{symbolsb}{132}
\DeclareMathSymbol{\gtrapprox}         {\mathrel}{symbolsb}{133}
\DeclareMathSymbol{\lnapprox}          {\mathrel}{symbolsb}{134}
\DeclareMathSymbol{\gnapprox}          {\mathrel}{symbolsb}{135}
\DeclareMathSymbol{\curlyeqprec}       {\mathrel}{symbolsb}{136}
\DeclareMathSymbol{\curlyeqsucc}       {\mathrel}{symbolsb}{137}
\DeclareMathSymbol{\precnsim}          {\mathrel}{symbolsb}{138}
\DeclareMathSymbol{\succnsim}          {\mathrel}{symbolsb}{139}
\DeclareMathSymbol{\precapprox}        {\mathrel}{symbolsb}{140}
\DeclareMathSymbol{\succapprox}        {\mathrel}{symbolsb}{141}
\DeclareMathSymbol{\precnapprox}       {\mathrel}{symbolsb}{142}
\DeclareMathSymbol{\succnapprox}       {\mathrel}{symbolsb}{143}
```

```
\DeclareMathSymbol{\leqq}               {\mathrel}{symbolsb}{144}
\DeclareMathSymbol{\geqq}               {\mathrel}{symbolsb}{145}
\DeclareMathSymbol{\nleqq}              {\mathrel}{symbolsb}{146}
\DeclareMathSymbol{\ngeqq}              {\mathrel}{symbolsb}{147}
\DeclareMathSymbol{\lneqq}              {\mathrel}{symbolsb}{148}
\DeclareMathSymbol{\gneqq}              {\mathrel}{symbolsb}{149}
\DeclareMathSymbol{\lvertneqq}          {\mathrel}{symbolsb}{150}
\DeclareMathSymbol{\gvertneqq}          {\mathrel}{symbolsb}{151}
\DeclareMathSymbol{\lessdot}            {\mathrel}{symbolsb}{152}
\DeclareMathSymbol{\gtrdot}             {\mathrel}{symbolsb}{153}
\DeclareMathSymbol{\lessgtr}            {\mathrel}{symbolsb}{154}
\DeclareMathSymbol{\gtrless}            {\mathrel}{symbolsb}{155}
\DeclareMathSymbol{\lesseqgtr}          {\mathrel}{symbolsb}{156}
\DeclareMathSymbol{\gtreqless}          {\mathrel}{symbolsb}{157}
\DeclareMathSymbol{\lesseqqgtr}         {\mathrel}{symbolsb}{158}
\DeclareMathSymbol{\gtreqqless}         {\mathrel}{symbolsb}{159}
\DeclareMathSymbol{\lneq}               {\mathrel}{symbolsb}{160}
\DeclareMathSymbol{\gneq}               {\mathrel}{symbolsb}{161}
\DeclareMathSymbol{\nsubseteq}          {\mathrel}{symbolsb}{162}
\DeclareMathSymbol{\nsupseteq}          {\mathrel}{symbolsb}{163}
\DeclareMathSymbol{\subsetneq}          {\mathrel}{symbolsb}{164}
\DeclareMathSymbol{\supsetneq}          {\mathrel}{symbolsb}{165}
\DeclareMathSymbol{\varsubsetneq}       {\mathrel}{symbolsb}{166}
\DeclareMathSymbol{\varsupsetneq}       {\mathrel}{symbolsb}{167}
\DeclareMathSymbol{\subseteqq}          {\mathrel}{symbolsb}{168}
\DeclareMathSymbol{\supseteqq}          {\mathrel}{symbolsb}{169}
\DeclareMathSymbol{\nsubseteqq}         {\mathrel}{symbolsb}{170}
\DeclareMathSymbol{\nsupseteqq}         {\mathrel}{symbolsb}{171}
\DeclareMathSymbol{\subsetneqq}         {\mathrel}{symbolsb}{172}
\DeclareMathSymbol{\supsetneqq}         {\mathrel}{symbolsb}{173}
\DeclareMathSymbol{\varsubsetneqq}      {\mathrel}{symbolsb}{174}
\DeclareMathSymbol{\varsupsetneqq}      {\mathrel}{symbolsb}{175}
\DeclareMathSymbol{\Subset}             {\mathrel}{symbolsb}{176}
\DeclareMathSymbol{\Supset}             {\mathrel}{symbolsb}{177}
\DeclareMathSymbol{\Cup}                {\mathbin}{symbolsb}{178}
\DeclareMathSymbol{\Cap}                {\mathbin}{symbolsb}{179}
\DeclareMathSymbol{\therefore}          {\mathrel}{symbolsb}{180}
\DeclareMathSymbol{\because}            {\mathrel}{symbolsb}{181}
\DeclareMathSymbol{\pitchfork}          {\mathrel}{symbolsb}{182}
\DeclareMathSymbol{\dotplus}            {\mathbin}{symbolsb}{183}
\DeclareMathSymbol{\risingdotseq}       {\mathrel}{symbolsb}{184}
\DeclareMathSymbol{\doteqdot}           {\mathrel}{symbolsb}{185}
\DeclareMathSymbol{\fallingdotseq}      {\mathrel}{symbolsb}{186}
\DeclareMathSymbol{\triangleq}          {\mathrel}{symbolsb}{187}
\DeclareMathSymbol{\circeq}             {\mathrel}{symbolsb}{188}
\DeclareMathSymbol{\eqcirc}             {\mathrel}{symbolsb}{189}
\DeclareMathSymbol{\bumpeq}             {\mathrel}{symbolsb}{190}
\DeclareMathSymbol{\Bumpeq}             {\mathrel}{symbolsb}{191}
\DeclareMathSymbol{\curlywedge}         {\mathbin}{symbolsb}{192}
\DeclareMathSymbol{\curlyvee}           {\mathbin}{symbolsb}{193}
\DeclareMathSymbol{\smallsmile}         {\mathrel}{symbolsb}{194}
\DeclareMathSymbol{\smallfrown}         {\mathrel}{symbolsb}{195}
\DeclareMathSymbol{\veebar}             {\mathbin}{symbolsb}{196}
\DeclareMathSymbol{\barwedge}           {\mathbin}{symbolsb}{197}
```

```
\DeclareMathSymbol{\doublebarwedge}    {\mathbin}{symbolsb}{198}
```

Slot 199 is empty.

```
\DeclareMathSymbol{\measuredangle}     {\mathord}{symbolsb}{200}
\DeclareMathSymbol{\sphericalangle}    {\mathord}{symbolsb}{201}
\DeclareMathSymbol{\nmid}              {\mathrel}{symbolsb}{202}
\DeclareMathSymbol{\nparallel}         {\mathrel}{symbolsb}{203}
\DeclareMathSymbol{\shortmid}          {\mathrel}{symbolsb}{204}
\DeclareMathSymbol{\shortparallel}     {\mathrel}{symbolsb}{205}
\DeclareMathSymbol{\nshortmid}         {\mathrel}{symbolsb}{206}
\DeclareMathSymbol{\nshortparallel}    {\mathrel}{symbolsb}{207}
\DeclareMathSymbol{\Vdash}             {\mathrel}{symbolsb}{208}
\DeclareMathSymbol{\Vvdash}            {\mathrel}{symbolsb}{209}
\DeclareMathSymbol{\vDash}             {\mathrel}{symbolsb}{210}
\DeclareMathSymbol{\VDash}             {\mathrel}{symbolsb}{211}
\DeclareMathSymbol{\nVdash}            {\mathrel}{symbolsb}{212}
\DeclareMathSymbol{\nVvdash}           {\mathrel}{symbolsb}{213}
\DeclareMathSymbol{\nvDash}            {\mathrel}{symbolsb}{214}
\DeclareMathSymbol{\nVDash}            {\mathrel}{symbolsb}{215}
\DeclareMathSymbol{\dashV}             {\mathrel}{symbolsb}{216}
\DeclareMathSymbol{\dashVv}            {\mathrel}{symbolsb}{217}
\DeclareMathSymbol{\Dashv}             {\mathrel}{symbolsb}{218}
\DeclareMathSymbol{\DashV}             {\mathrel}{symbolsb}{219}
\DeclareMathSymbol{\ndashV}            {\mathrel}{symbolsb}{220}
\DeclareMathSymbol{\ndashVv}           {\mathrel}{symbolsb}{221}
\DeclareMathSymbol{\nDashv}            {\mathrel}{symbolsb}{222}
\DeclareMathSymbol{\nDashV}            {\mathrel}{symbolsb}{223}
\DeclareMathSymbol{\boxdot}            {\mathbin}{symbolsb}{224}
\DeclareMathSymbol{\boxplus}           {\mathbin}{symbolsb}{225}
\DeclareMathSymbol{\boxminus}          {\mathbin}{symbolsb}{226}
\DeclareMathSymbol{\boxtimes}          {\mathbin}{symbolsb}{227}
\DeclareMathSymbol{\blacksquare}       {\mathord}{symbolsb}{228}
\DeclareMathSymbol{\lozenge}           {\mathord}{symbolsb}{229}
\DeclareMathSymbol{\blacklozenge}      {\mathord}{symbolsb}{230}
\DeclareMathSymbol{\bigstar}           {\mathord}{symbolsb}{231}
\DeclareMathSymbol{\blacktriangleleft} {\mathbin}{symbolsb}{232}
\DeclareMathSymbol{\blacktriangleright}{\mathbin}{symbolsb}{233}
\DeclareMathSymbol{\blacktriangle}     {\mathord}{symbolsb}{234}
\DeclareMathSymbol{\blacktriangledown} {\mathord}{symbolsb}{235}
\DeclareMathSymbol{\vartriangle}       {\mathord}{symbolsb}{236}
\DeclareMathSymbol{\triangledown}      {\mathord}{symbolsb}{237}
\DeclareMathSymbol{\smallsquare}       {\mathord}{symbolsb}{238}
\DeclareMathSymbol{\smalltriangle}     {\mathord}{symbolsb}{239}
\DeclareMathSymbol{\centerdot}         {\mathbin}{symbolsb}{240}
\DeclareMathSymbol{\complement}        {\mathord}{symbolsb}{241}
\DeclareMathSymbol{\intercal}          {\mathbin}{symbolsb}{242}
\DeclareMathSymbol{\checkmark}         {\mathord}{symbolsb}{243}
\DeclareMathSymbol{\varnothing}        {\mathord}{symbolsb}{244}
\DeclareMathSymbol{\varpropto}         {\mathrel}{symbolsb}{245}
\DeclareMathSymbol{\smallsetminus}     {\mathbin}{symbolsb}{246}
```

5.2.3 The MS2 encoding

Slots 0–24, 27–31 and 35 are empty, slots 25 and 26 are the old german dotless i and j. Slot 32 is the space, slots 40–47 are new basic size delimiters.

Slots 48–57, 65–92 and 97–122 are the old german alphabet.

```
\DeclareMathSymbol{\smallsigmaint}  {\mathop} {symbolsc}{33}
\DeclareMathSymbol{\smallslashint}  {\mathop} {symbolsc}{34}
```

The following relies on the fact that the accents option is executed before the `amssymb` option!

```
\providecommand{\DeclareMathAccents}[7]{\DeclareMathAccent{#1}{#5}{#6}{#7}}

\DeclareMathAccents{\paren}{\Paren}{\uparen}{\uParen}{\mathord}{symbolsc}{36}
\DeclareMathAccents{\pareninv}{\Pareninv}{\upareninv}{\uPareninv}{\mathord}{symbolsc}{37}
\DeclareMathAccents{\tria}{\Tria}{\utria}{\uTria}{\mathord}{symbolsc}{38}
\DeclareMathAccents{\triainv}{\Triainv}{\utriainv}{\uTriainv}{\mathord}{symbolsc}{39}
```

Misc new `\mathbin`s.

```
\DeclareMathSymbol{\cupdot}           {\mathbin}{symbolsc}{58}
\DeclareMathSymbol{\capdot}           {\mathbin}{symbolsc}{59}
\DeclareMathSymbol{\oblong}           {\mathbin}{symbolsc}{60}
\DeclareMathSymbol{\dijkstrachoice}   {\mathbin}{symbolsc}{61}
\DeclareMathSymbol{\operp}            {\mathbin}{symbolsc}{64}
```

5.2.4 The arrow kit

The upper half of MS2 contains the arrow kit.

First come some control glyphs which are used in the definition of the extensible arrow macros.

```
\DeclareMathSymbol{\@NONE}          {\mathord}{symbolsc}{128}
\DeclareMathSymbol{\@EXT}           {\mathord}{symbolsc}{129}
\DeclareMathSymbol{\@NEG}           {\mathord}{symbolsc}{130}
\DeclareMathSymbol{\@NEGEXT}        {\mathord}{symbolsc}{131}
\DeclareMathSymbol{\@GAP}           {\mathord}{symbolsc}{132}
\DeclareMathSymbol{\@GAPEXT}        {\mathord}{symbolsc}{133}
\DeclareMathSymbol{\@SQUIG}         {\mathord}{symbolsc}{134}
\DeclareMathSymbol{\@DASH}          {\mathord}{symbolsc}{135}
```

Now comes the list of arrow heads.

```
\DeclareMathSymbol{\head}           {\mathord}{symbolsc}{136}
\DeclareMathSymbol{\Head}           {\mathord}{symbolsc}{137}
\DeclareMathSymbol{\HEAD}           {\mathord}{symbolsc}{138}
\DeclareMathSymbol{\thickhead}      {\mathord}{symbolsc}{139}
\DeclareMathSymbol{\doublehead}     {\mathord}{symbolsc}{140}
\DeclareMathSymbol{\mapsfromhead}   {\mathord}{symbolsc}{141}
\DeclareMathSymbol{\Mapsfromhead}   {\mathord}{symbolsc}{142}
\DeclareMathSymbol{\MAPSfromhead}   {\mathord}{symbolsc}{143}
\DeclareMathSymbol{\hookuphead}     {\mathord}{symbolsc}{144}
\DeclareMathSymbol{\hookdownhead}   {\mathord}{symbolsc}{145}
\DeclareMathSymbol{\harpoonuphead}  {\mathord}{symbolsc}{146}
\DeclareMathSymbol{\harpoondownhead} {\mathord}{symbolsc}{147}
\DeclareMathSymbol{\harpoonsuphead}  {\mathord}{symbolsc}{148}
\DeclareMathSymbol{\harpoonsdownhead}{\mathord}{symbolsc}{149}
```

```
\DeclareMathSymbol{\harpoonshead}     {\mathord}{symbolsc}{150}
\DeclareMathSymbol{\headsup}          {\mathord}{symbolsc}{151}
\DeclareMathSymbol{\headsdown}        {\mathord}{symbolsc}{152}
\DeclareMathSymbol{\heads}            {\mathord}{symbolsc}{153}
\DeclareMathSymbol{\featherhead}      {\mathord}{symbolsc}{154}
\DeclareMathSymbol{\feathershead}     {\mathord}{symbolsc}{155}
\DeclareMathSymbol{\curlyuphead}      {\mathord}{symbolsc}{156}
\DeclareMathSymbol{\curlydownhead}    {\mathord}{symbolsc}{157}
\DeclareMathSymbol{\circhead}         {\mathord}{symbolsc}{158}
\DeclareMathSymbol{\bullethead}       {\mathord}{symbolsc}{159}
```

Slots 160–255 are parts of the arrow kit which are accessed only by ligatures.

`\@extpart`
`\@extpartnegated`
`\@extpartbroken`

The macros `\@extpart`, `\@extpartnegated` and `\@extpartbroken` are used in the arrow commands to produce arrow stems of different lengths.

```
\def\@extbuilder#1#2#3{%
  \edef\@tempa{%
    \expandafter\@extbuild@r\romannumeral\number#3001\relax}%
  \@tempa\ifodd#3#1\else#2\fi\@tempa}


\def\@extbuild@r#1#2{%
  \if#2m%
    \@EXT
  \expandafter\@extbuild@r
  \fi}

\def\@extpart{\@extbuilder\@EXT\@empty}
\def\@extpartnegated{\@extbuilder\@NEGEXT\@NEG}
\def\@extpartbroken{\@extbuilder\@GAPEXT\@GAP}
```

`\leftrightextarrow`

The macro `\leftrightextarrow` takes up to five arguments. The optional first argument is a single letter B or N, indicating that the arrow is broken or negated. The second argument is a single digit specifiying the length of the arrow. The optional third argument is a single letter D or S, indicating that the arrow is dashed or squiggly. The fourth and fifth argument are the left and right arrow head. They must be among the symbols `\head`. . . `\bullethead` declared above.

```
\newcommand{\leftrightextarrow}[2][]{%
  \def\@rrowlength{#2}%
  \ifx#1N\relax\let\next\lrarrownegated
  \else\ifx#1B\relax\let\next\lrarrowbroken
       \else\let\next\lrarrow\fi\fi\next
}
```

`\leftextarrow`

The macro `\leftextarrow` takes up to four arguments. The first three have the same meaning as the corresponding arguments of `\leftrightextarrow`, the fourth is the left arrow head.

```
\newcommand{\leftextarrow}[2][]{%
  \def\@rrowlength{#2}%
  \ifx#1N\relax\let\next\larrownegated
  \else\ifx#1B\relax\let\next\larrowbroken
       \else\let\next\larrow\fi\fi\next
}
```

`\rightextarrow` The macro `\rightextarrow` takes up to four arguments. The first three have the same meaning as the corresponding arguments of `\leftrightextarrow`, the fourth is the right arrow head.

```
\newcommand{\rightextarrow}[2][]{%
  \def\@rrowlength{#2}%
  \ifx#1N\relax\let\next\rarrownegated
  \else\ifx#1B\relax\let\next\rarrowbroken
       \else\let\next\rarrow\fi\fi\next
}
```

The following macros are used in `\leftrightextarrow`, `\leftextarrow` and `\rightextarrow`.

```
\newcommand{\larrow}[2][]{%
 \mathrel{#2\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpart{\@rrowlength}#2\@NONE}}
\newcommand{\larrownegated}[2][]{%
 \mathrel{#2\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpartnegated{\@rrowlength}#2\@NONE}}
\newcommand{\larrowbroken}[2][]{%
 \mathrel{#2\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpartbroken{\@rrowlength}#2\@NONE}}
\newcommand{\rarrow}[2][]{%
 \mathrel{#2\@NONE\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpart{\@rrowlength}#2}}
\newcommand{\rarrownegated}[2][]{%
 \mathrel{#2\@NONE\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpartnegated{\@rrowlength}#2}}
\newcommand{\rarrowbroken}[2][]{%
 \mathrel{#2\@NONE\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpartbroken{\@rrowlength}#2}}
\newcommand{\lrarrow}[3][]{%
 \mathrel{#2\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpart{\@rrowlength}#3}}
\newcommand{\lrarrownegated}[3][]{%
 \mathrel{#2\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpartnegated{\@rrowlength}#3}}
\newcommand{\lrarrowbroken}[3][]{%
 \mathrel{#2\ifx#1D\@DASH\else\ifx#1S\@SQUIG\fi\fi
          \@extpartbroken{\@rrowlength}#3}}
```

Now we redefine the `amssymb` arrows using the arrow kit.

```
\DeclareCompoundMathSymbol{\dashleftarrow}   {\mathrel}{\head\@DASH\head\@NONE}
\DeclareCompoundMathSymbol{\dashrightarrow}  {\mathrel}{\head\@NONE\@DASH\head}
\DeclareCompoundMathSymbol{\leftleftarrows}  {\mathrel}{\heads\heads\@NONE}
\DeclareCompoundMathSymbol{\rightrightarrows}{\mathrel}{\heads\@NONE\heads}
\DeclareCompoundMathSymbol{\leftrightarrows} {\mathrel}{\headsup\headsdown}
\DeclareCompoundMathSymbol{\rightleftarrows} {\mathrel}{\headsdown\headsup}
\DeclareCompoundMathSymbol{\twoheadleftarrow}{\mathrel}{\doublehead\doublehead\@NONE}
\DeclareCompoundMathSymbol{\twoheadrightarrow}{\mathrel}{\doublehead\@NONE\doublehead}
\DeclareCompoundMathSymbol{\Lleftarrow}      {\mathrel}{\HEAD\HEAD\@NONE}
\DeclareCompoundMathSymbol{\Rrightarrow}     {\mathrel}{\HEAD\@NONE\HEAD}
\DeclareCompoundMathSymbol{\leftarrowtail}   {\mathrel}{\head\featherhead}
\DeclareCompoundMathSymbol{\rightarrowtail}  {\mathrel}{\featherhead\head}
```

```
\DeclareCompoundMathSymbol{\looparrowleft}   {\mathrel}{\head\curlyuphead}
\DeclareCompoundMathSymbol{\looparrowright}  {\mathrel}{\curlyuphead\head}
\DeclareCompoundMathSymbol{\leftrightharpoons}{\mathrel}{\harpoonsuphead\harpoonsdownhead}
\DeclareCompoundMathSymbol{\rightleftharpoons}{\mathrel}{\harpoonsdownhead\harpoonsuphead}
\DeclareCompoundMathSymbol{\multimap}        {\mathrel}{\circhead\bullethead}
\DeclareCompoundMathSymbol{\leftsquigarrow}  {\mathrel}{\head\@SQUIG\head\@NONE}
\DeclareCompoundMathSymbol{\rightsquigarrow} {\mathrel}{\head\@NONE\@SQUIG\head}
\DeclareCompoundMathSymbol{\leftrightsquigarrow}{\mathrel}{\head\@SQUIG\head}
\DeclareCompoundMathSymbol{\nleftarrow}      {\mathrel}{\head\@NEG\head\@NONE}
\DeclareCompoundMathSymbol{\nrightarrow}     {\mathrel}{\head\@NONE\@NEG\head}
\DeclareCompoundMathSymbol{\nleftrightarrow} {\mathrel}{\head\@NEG\head}
\DeclareCompoundMathSymbol{\nLeftarrow}      {\mathrel}{\Head\@NEG\Head\@NONE}
\DeclareCompoundMathSymbol{\nRightarrow}     {\mathrel}{\Head\@NONE\@NEG\Head}
\DeclareCompoundMathSymbol{\nLeftrightarrow} {\mathrel}{\Head\@NEG\Head}
```

We also define arrow filling macros.

```
\def\larrowfill#1{%
 $#1\@EXT\mkern-7mu\cleaders\hbox{$\@EXT#1$}\hfill\mkern-7mu\@EXT#1$}
\def\rarrowfill#1{%
 $\@EXT#1\mkern-7mu\cleaders\hbox{$\@EXT#1$}\hfill\mkern-7mu\@EXT#1#1$}
\def\lrarrowfill#1#2{%
 $#1\@EXT\mkern-7mu\cleaders\hbox{$\@EXT#1$}\hfill\mkern-7mu\@EXT#2#2$}
```

5.2.5 Aliases

Some symbols have traditionally more than one name. We have to keep these names for backward compatibility.

```
\let\doublecup\Cup
\let\doublecap\Cap
\let\Doteq\doteqdot
} % \DeclareOption{amssymb}
```

5.3 New extensibles and operators

The new math font encodings have an extra encoding MX1, containing only new extensibles and operators. We provide access to these with the `extraops` option.

```
\DeclareOption{extraops}{
```

5.3.1 NFSS declarations

We have to make sure that the `symbolc` math alphabet containing the basic size new delimiters is available.

```
\@ifisencoding{MS1}{}{%
 \DeclareFontEncoding{MS2}{}{\noaccents@}
 \DeclareFontSubstitution{MS2}{cm}{m}{n}
 \DeclareSymbolFont{symbolsc}{MS2}{cm}{m}{n}
 \SetSymbolFont{symbolsc}{bold}{MS2}{cm}{b}{n}}

\DeclareFontEncoding{MX1}{}{}
\DeclareFontSubstitution{MX1}{cm}{m}{n}
\DeclareSymbolFont{largesymbolsb}{MX1}{cm}{m}{\@extshape}
\SetSymbolFont{largesymbolsb}{bold}{MX1}{cm}{b}{\@extshape}
```

5.3.2 The MX1 encoding

Slots 0–31 are reserved for big operators in textstyle and displaystyle, of which slots 22–23 and 30–31 are currently empty.

```
\DeclareMathSymbol{\bigcupdot}        {\mathop}{largesymbolsb} {0}
\DeclareMathSymbol{\bigcapdot}        {\mathop}{largesymbolsb} {1}
\DeclareMathSymbol{\bigparallel}      {\mathop}{largesymbolsb} {2}
\DeclareMathSymbol{\biginterleaving}  {\mathop}{largesymbolsb} {3}
\DeclareMathSymbol{\bigdijkstrachoice}{\mathop}{largesymbolsb} {4}
\DeclareMathSymbol{\bigoblong}        {\mathop}{largesymbolsb} {5}
\DeclareMathSymbol{\sigmaintop}       {\mathop}{largesymbolsb} {6}
\DeclareMathSymbol{\slashintop}       {\mathop}{largesymbolsb} {7}

\DeclareMathSymbol{\bigampersand}     {\mathop}{largesymbolsb}{16}
\DeclareMathSymbol{\bigdnasrepma}     {\mathop}{largesymbolsb}{17}
\DeclareMathSymbol{\bigast}           {\mathop}{largesymbolsb}{18}
\DeclareMathSymbol{\bighash}          {\mathop}{largesymbolsb}{19}
\DeclareMathSymbol{\bigplus}          {\mathop}{largesymbolsb}{20}
\DeclareMathSymbol{\bigtimes}         {\mathop}{largesymbolsb}{21}
\DeclareMathSymbol{\bigboxplus}       {\mathop}{largesymbolsb}{22}
\DeclareMathSymbol{\bigboxtimes}      {\mathop}{largesymbolsb}{23}

\DeclareMathSymbol{\bigoperp}         {\mathop}{largesymbolsb}{50}
```

While we are at it, lets not forget to define some compound symbols.

```
\DeclareCompoundMathSymbol{\sigmaint}{\mathop}{\sigmaintop\nolimits}
\DeclareCompoundMathSymbol{\slashint}{\mathop}{\slashintop\nolimits}
```

Slot 32 is the space, slots 33–39 are the entry points to various wide accents.

```
\DeclareMathAccent{\widebar}          {\mathord}{largesymbolsb}{40}
\DeclareMathAccent{\widearc}          {\mathord}{largesymbolsb}{41}
\DeclareMathAccent{\widevector}       {\mathord}{largesymbolsb}{42}
\DeclareMathAccent{\widebackvector}   {\mathord}{largesymbolsb}{43}
\DeclareMathAccent{\widedoublevector} {\mathord}{largesymbolsb}{44}
\DeclareMathAccent{\wideparen}        {\mathord}{largesymbolsb}{45}
\DeclareMathAccent{\widetriangle}     {\mathord}{largesymbolsb}{46}
```

Slots 40–45 are the entry points to big delimiters, of which there should be at least four size as usual.

Slots 48–49, 56–57, 64–65 and 46–47, 54–55, 62–63, 70–71 contain the building blocks for extensible delimiters, of which only slots 46–47, 48–49 and 70–71 are the defining ones. All the remaining slots in between are empty, so there would be enough room for two more extensible delimiters.

```
\DeclareMathDelimiter{\ltortoise}{\mathopen} {symbolsc}{40}{largesymbolsb}{40}
\DeclareMathDelimiter{\rtortoise}{\mathclose}{symbolsc}{41}{largesymbolsb}{41}
\DeclareMathDelimiter{\ltriangle}{\mathopen} {symbolsc}{42}{largesymbolsb}{42}
\DeclareMathDelimiter{\rtriangle}{\mathclose}{symbolsc}{43}{largesymbolsb}{43}
\DeclareMathDelimiter{\lmultiset}{\mathopen} {symbolsc}{44}{largesymbolsb}{44}
\DeclareMathDelimiter{\rmultiset}{\mathclose}{symbolsc}{45}{largesymbolsb}{45}
\DeclareMathDelimiter{\lGroup}   {\mathopen} {symbolsc}{46}{largesymbolsb}{70}
\DeclareMathDelimiter{\rGroup}   {\mathclose}{symbolsc}{47}{largesymbolsb}{71}
```

Slots 72–126 and 128–255 are a variable area providing room for wide accents and big delimiters, at the font designer's disposal.

Of course, it would be much nicer to have a more rational arrangement, if weren't constrained by compatibility requirements. If these could be relaxed, we might split MXP/MX1 by type to have delimiters + radicals in one font and operators + wide acents + over/underbraces in another one.

Anyway, we're finished with the declarations for the MX1 encoding, all of which was placed inside a lenghty `\DeclareOptions` blocks.

```
} % \DeclareOption{extraops}
```

5.4 Non-math symbols

The new math font encodings no longer contain some symbols which are not math-specific, but used to be in the old math fonts. We provide access to them with the `textcomp` option.

```
\DeclareOption{textcomp}{

\AtEndOfPackage{
  \RequirePackage{textcomp}
  \RequirePackage{amstext}
}

\begingroup
\let\define@compound\gdef
\DeclareCompoundMathSymbol{\mathparagraph}{\mathord}{\text{\textparagraph}}
\DeclareCompoundMathSymbol{\mathsterling} {\mathord}{\text{\textsterling}}
\DeclareCompoundMathSymbol{\mathdollar}   {\mathord}{\text{\textdollar}}
\DeclareCompoundMathSymbol{\mathsection}  {\mathord}{\text{\textsection}}

\DeclareCompoundMathSymbol{\yen}          {\mathord}{\text{\textyen}}
\DeclareCompoundMathSymbol{\circledR}     {\mathord}{\text{\textregistered}}
```

The following doesn't work. Why ?

```
%\DeclareCompoundMathSymbol{\circledS}     {\mathord}{\text{\textcircled{S}}}
\endgroup

} % \DeclareOption{textcomp}
```

5.5 Extensibles in more sizes

The new math font encodings provide enough flexibility in the MXP and MX1 encodings to allow for varying numbers of larger variants or wider accents. We provide more sizes with the `manysizes` option.

```
\DeclareOption{manysizes}{

\def\@extshape{s}

\SetSymbolFont{largesymbols}     {normal}{MXP}{cm}{m}{\@extshape}
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{cm}{m}{\@extshape}

\SetSymbolFont{largesymbols}     {bold}{MXP}{cm}{b}{\@extshape}
\ProvideSymbolFont{largesymbolsb}{bold}{MX1}{cm}{b}{\@extshape}

} % \DeclareOption{manysizes}
```

5.6 Scaling of the extensible fonts, part I

We load the extensible fonts in more than one size by default now. This is in contrast to the traditional setup where only one size of `cmex` was used. Users who don't want to use the `oldmath` package, but need to load the extensible fonts in only one size should use the `noexscale` option.

The `\ifnoexscale@` switch is needed, since this option has to be implemented in a two stages. We change `\@ExtensibleFontShape` here, then load the math layout, then define appropriate fonts to use for the radicals.

```
\newif\ifnoexscale@
\DeclareOption{noexscale}{%

\noexscale@true
\def\@ExtensibleFontShape#1#2#3#4#5#6{%
  \DeclareFontShape{#1}{#2}{#3}{#4}{<->sfixed*#51000}{#6}}

\def\big#1{{\hbox{$\left#1\vbox to8.5\p@{}\right.\n@space$}}}
\def\Big#1{{\hbox{$\left#1\vbox to11.5\p@{}\right.\n@space$}}}
\def\bigg#1{{\hbox{$\left#1\vbox to14.5\p@{}\right.\n@space$}}}
\def\Bigg#1{{\hbox{$\left#1\vbox to17.5\p@{}\right.\n@space$}}}

} % \DeclareOption{noexscale}
```

5.7 Lucida options

```
\def\@lucidascale{0}
\DeclareOption{smallscale}{\def\@lucidascale{1}}
\DeclareOption{noscale}{\def\@lucidascale{2}}

\def\@lucidaitshape{n}
\DeclareOption{altitalic}{\def\@lucidaitshape{ai}}
\DeclareOption{upitalic}{\def\@lucidaitshape{ui}}
```

We also recognize the `lucidabr` options for the same purpose.

```
\DeclareOption{mathitalic1}{\def\@lucidaitshape{n}}
\DeclareOption{mathitalic2}{\def\@lucidaitshape{ai}}
\DeclareOption{mathitalic3}{\def\@lucidaitshape{ui}}
```

We rely on the fact that `manysizes` and `noexscale` are executed before the layout-changing options, since these use `\@extshape` and `\@ExtensibleFontShape`.

5.8 Layout changing

Any other option is treated as a potential layout change.

```
\DeclareOption*{

\InputIfFileExists{\CurrentOption.mfd}
  {\PackageInfo{newmath}{Changing math layout to \CurrentOption}
   \let\M@layout\CurrentOption}
  {\PackageWarningNoLine{newmath}{Math layout \CurrentOption\space not found}}

} % \DeclareOption*

\ProcessOptions
```

Here we check if the user has explicitly loaded a layout. If not, we reload the cm layout. Doing `\ExecuteOptions{cm}` won't work after `\ProcessOptions`, so we repeat the code here.

```
\def\x{none}
\ifx\m@layout\x
\InputIfFileExists{cm.mfd}
  {\PackageInfo{newmath}{Changing math layout to cm}
   \def\M@layout{cm}}
  {\PackageWarningNoLine{newmath}{Math layout cm not found}}
\fi
```

5.9 Scaling of the extensible fonts, part II

We append some code to implement the `noexscale` option. This should probably by integrated more closely with the math font loading of NFSS.

This switch would have to be extended to cover more layouts. More fonts would have to be added for additional versions. At that point, it would be better to drop this altogether or to find a proper solution.

```
\ifnoexscale@

\def\x{euler}%
\ifx\M@layout\x
\font\ex@ten@normal=xeb1000
\font\ex@seven@normal=xeb0700
\font\ex@five@normal=xeb0500
\font\ex@ten@bold=xebb1000
\font\ex@seven@bold=xebb0700
\font\ex@five@bold=xebb0500
\else
\font\ex@ten@normal=xmb1000
\font\ex@seven@normal=xmb0700
\font\ex@five@normal=xmb0500
\font\ex@ten@bold=xmbb1000
\font\ex@seven@bold=xmbb0700
\font\ex@five@bold=xmbb0500
\fi

\def\exsc@le@normal{%
 \textfont\symlargesymbols=\ex@ten@normal
 \scriptfont\symlargesymbols=\ex@seven@normal
 \scriptscriptfont\symlargesymbols=\ex@five@normal}

\def\exsc@le@bold{%
 \textfont\symlargesymbols=\ex@ten@bold
 \scriptfont\symlargesymbols=\ex@seven@bold
 \scriptscriptfont\symlargesymbols=\ex@five@bold}

\let\exsc@le\exsc@le@normal
```

FIX ME!!! This is just a hack, it will break for any version except 'normal' and 'bold'.

```
\let\mathversion\relax
```

```
\DeclareRobustCommand\mathversion[1]
         {\@nomath\mathversion
          \expandafter\ifx\csname mv@#1\endcsname\relax
          \@latex@error{Math version `#1' is not defined}\@eha\else
          \edef\math@version{#1}%
```

Here we insert two lines to switch the replacement fonts synchronously with the math version. A hook to do things at version-change time would be useful.

```
          \def\x{\global\let\exsc@le}%
          \expandafter\x\csname exsc@le@\math@version\endcsname
          \gdef\glb@currsize{}%
          \aftergroup\glb@settings
          \fi}

\let\@@sqrtsign\sqrtsign

\def\sqrtsign#1{{\mathpalette\@sqrtsign{#1}}}

\def\@sqrtsign#1#2{%
  % set #2 in cramped style #1
  \setbox0=\hbox{%
     \nulldelimiterspace=0pt
     $\m@th#1\radical0{#2}$}%
  % remove the extra vertical space
  % added by \radical
  \ifx#1\displaystyle
     \dimen0=\fontdimen8\textfont3
     \advance\dimen0 .25\fontdimen5\textfont2
  \else \dimen0=1.25\fontdimen8
     \ifx#1\textstyle \textfont
     \else \ifx#1\scriptstyle \scriptfont
          \else \scriptscriptfont
          \fi
     \fi 3
  \fi
  \advance\dimen0-\ht0 \ht0=-\dimen0
  % add the radical, using exscale locally
  \setbox1=\hbox{%
     $\m@th\exsc@le#1\@@sqrtsign{\box0}$}%
  \box1\relax}

\fi % \ifnoexscale@
⟨/newmath⟩
```

6 Math layouts

Other math layouts are realised in ⟨*layout*⟩`.mfd` files. These can contain

- `\SetSymbolFont` declarations for `operators` (T1), `symbols` (MC), `letters` (MSP) and `largesymbols` (MXP),
- `\ProvideSymbolFont` declarations for the `symbolsb` (MS1), `symbolsc` (MS2) and `largesymbolsb` (MX1),

- `\DeclareMathSizes` statements,
- assignments to `\thinmuskip`, `\medmuskip` and `\thickmuskip`.
- It might also be necessary to allow some communication with the `fd` files to overcome restrictions of NFSS (See the implementation of the `scale` options in the Lucida layout for an example).

The declarations for `largesymbols` and `largesymbolsb` should make use of `\@manysizesflag` and `\@exscaleflag` if appropriate.

You should use `\ProvideSymbolFont` rather than `\SetSymbolFont` for `symbolsb`,`symbolsc` and `largesymbolsb`, since these fonts will only be declared if the user has loaded `newmath` with the `amssymb` or `extraops` options.

6.1 The cm layout

We provide a Computer Modern layout with the `cm` option.

```
⟨*cm⟩
\SetSymbolFont    {operators}    {normal}{T1} {cmr}{m}{n}
\SetSymbolFont    {symbols}      {normal}{MC} {cm} {m}{n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{cm} {m}{\@extshape}
\SetSymbolFont    {letters}      {normal}{MSP}{cm} {m}{n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{cm} {m}{n}
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{cm} {m}{n}
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{cm} {m}{\@extshape}


\SetSymbolFont    {operators}    {bold}  {T1} {cmr}{bx}{n}
\SetSymbolFont    {symbols}      {bold}  {MC} {cm} {b} {n}
\SetSymbolFont    {largesymbols} {bold}  {MXP}{cm} {b} {\@extshape}
\SetSymbolFont    {letters}      {bold}  {MSP}{cm} {b} {n}
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{cm} {b} {n}
\ProvideSymbolFont{symbolsc}     {bold}  {MS2}{cm} {b} {n}
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{cm} {b} {\@extshape}
⟨/cm⟩
```

6.2 The Euler layout

We provide an Euler layout with the `euler` option.

```
⟨*euler⟩
\SetSymbolFont    {operators}    {normal}{T1} {cmr}{m} {n}
\SetSymbolFont    {symbols}      {normal}{MC} {eu} {m} {n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{eu} {m} {\@extshape}
\SetSymbolFont    {letters}      {normal}{MSP}{eu} {m} {n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{eu} {m} {n}% missing font
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{eu} {m} {n}% missing font
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{eu} {m} {\@extshape}% missing font

\SetSymbolFont    {operators}    {bold}  {T1} {cmr}{bx}{n}
\SetSymbolFont    {symbols}      {bold}  {MC} {eu} {b} {n}
\SetSymbolFont    {largesymbols} {bold}  {MXP}{eu} {b} {\@extshape}
\SetSymbolFont    {letters}      {bold}  {MSP}{eu} {b} {n}
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{eu} {b} {n}% missing font
```

```
\ProvideSymbolFont{symbolsc}      {bold}  {MS2}{eu} {b} {n}% missing font
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{eu} {b} {\@extshape}% missing font
⟨/euler⟩
```

6.3 The concrete layout

We provide a concrete layout with the `concrete` option. This layout is much less complete than the `cm` and `euler` layouts.

```
⟨*concrete⟩
\SetSymbolFont    {operators}    {normal}{T1} {ccr}{m} {n}
\SetSymbolFont    {symbols}      {normal}{MC} {cc} {m} {n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{cc} {m} {n}% missing font
\SetSymbolFont    {letters}      {normal}{MSP}{cc} {m} {n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{cc} {m} {n}
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{cc} {m} {n}
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{cc} {m} {n}% missing font


\SetSymbolFont    {operators}    {bold}  {T1} {ccr}{bx}{n}
\SetSymbolFont    {symbols}      {bold}  {MC} {cc} {b} {n}% missing font
\SetSymbolFont    {largesymbols} {bold}  {MXP}{cc} {b} {n}% missing font
\SetSymbolFont    {letters}      {bold}  {MSP}{cc} {b} {n}% missing font
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{cc} {b} {n}% missing font
\ProvideSymbolFont{symbolsc}     {bold}  {MS2}{cc} {b} {n}% missing font
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{cc} {b} {n}% missing font
⟨/concrete⟩
```

6.4 The Adobe symbol layout

We provide a layout using the Adobe symbol fonts with the `mathptm` option. This layout is even less complete than the `concrete` layout.

```
⟨*mathptm⟩
\SetSymbolFont    {operators}    {normal}{T1} {ptm}{m}{n}
\SetSymbolFont    {symbols}      {normal}{MC} {ptm}{m}{n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{ptm}{m}{n}% missing font
\SetSymbolFont    {letters}      {normal}{MSP}{ptm}{m}{n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{ptm}{m}{n}% missing font
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{ptm}{m}{n}% missing font
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{ptm}{m}{n}% missing font

\SetSymbolFont    {operators}    {bold}  {T1} {ptm}{b}{n}
\SetSymbolFont    {symbols}      {bold}  {MC} {ptm}{b}{n}% missing font
\SetSymbolFont    {largesymbols} {bold}  {MXP}{ptm}{b}{n}% missing font
\SetSymbolFont    {letters}      {bold}  {MSP}{ptm}{b}{n}% missing font
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{ptm}{b}{n}% missing font
\ProvideSymbolFont{symbolsc}     {bold}  {MS2}{ptm}{b}{n}% missing font
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{ptm}{b}{n}% missing font
```

The following values are taken from the `mathptm` package.

```
\DeclareMathSizes{5}       {5}       {5}       {5}
\DeclareMathSizes{6}       {6}       {5}       {5}
\DeclareMathSizes{7}       {7}       {5}       {5}
\DeclareMathSizes{8}       {8}       {6}       {5}
```

```
\DeclareMathSizes{9}       {9}       {7}       {5}
\DeclareMathSizes{\@xpt}   {\@xpt}   {7.4}     {6}
\DeclareMathSizes{\@xipt}  {\@xipt}  {8}       {6}
\DeclareMathSizes{\@xiipt} {\@xiipt} {9}       {7}
\DeclareMathSizes{\@xivpt} {\@xivpt} {\@xipt}  {8}
\DeclareMathSizes{\@xviipt}{\@xviipt}{\@xiipt} {\@xpt}
\DeclareMathSizes{\@xxpt}  {\@xxpt}  {\@xivpt} {\@xiipt}
\DeclareMathSizes{\@xxvpt} {\@xxvpt} {\@xviipt}{\@xivpt}

\thinmuskip=2mu
\medmuskip=2.5mu plus 1mu minus 1mu
\thickmuskip=4mu plus 1.5mu minus 1mu
⟨/mathptm⟩
```

6.5 The Mathematica layout

We provide a layout using the Mathematica fonts with the `mathematica` option. This layout is suitable for use with the `times` package. It has the advantage over `mathptm` that it avoids the mixture of cm and type 1 fonts. You have to have mathematica (or at least the fonts) to use it though.

```
⟨*mathematica⟩
\SetSymbolFont    {operators}    {normal}{T1} {ptm}{m}{n}
\SetSymbolFont    {symbols}      {normal}{MC} {mm} {m}{n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{mm} {m}{n}
\SetSymbolFont    {letters}      {normal}{MSP}{mm} {m}{n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{mm} {m}{n}
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{mm} {m}{n}
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{mm} {m}{n}% missing font

\SetSymbolFont    {operators}    {bold}  {T1} {ptm}{b}{n}
\SetSymbolFont    {symbols}      {bold}  {MC} {mm} {b}{n}
\SetSymbolFont    {largesymbols} {bold}  {MXP}{mm} {b}{n}
\SetSymbolFont    {letters}      {bold}  {MSP}{mm} {b}{n}
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{mm} {b}{n}
\ProvideSymbolFont{symbolsc}     {bold}  {MS2}{mm} {b}{n}
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{mm} {b}{n}% missing font
```

The following values are the same as for the `mathptm` option. I can't judge their appropriateness.

```
\DeclareMathSizes{5}       {5}       {5}       {5}
\DeclareMathSizes{6}       {6}       {5}       {5}
\DeclareMathSizes{7}       {7}       {5}       {5}
\DeclareMathSizes{8}       {8}       {6}       {5}
\DeclareMathSizes{9}       {9}       {7}       {5}
\DeclareMathSizes{\@xpt}   {\@xpt}   {7.4}     {6}
\DeclareMathSizes{\@xipt}  {\@xipt}  {8}       {6}
\DeclareMathSizes{\@xiipt} {\@xiipt} {9}       {7}
\DeclareMathSizes{\@xivpt} {\@xivpt} {\@xipt}  {8}
\DeclareMathSizes{\@xviipt}{\@xviipt}{\@xiipt} {\@xpt}
\DeclareMathSizes{\@xxpt}  {\@xxpt}  {\@xivpt} {\@xiipt}
\DeclareMathSizes{\@xxvpt} {\@xxvpt} {\@xviipt}{\@xivpt}

\thinmuskip=2mu
```

```
\medmuskip=2.5mu plus 1mu minus 1mu
\thickmuskip=4mu plus 1.5mu minus 1mu
⟨/mathematica⟩
```

6.6 The Lucida layout

We provide two `mfd` files for Lucida, `lucida.mfd` and `lucidexp.mfd`, for the use without or with the Lucida Expert fonts.

```
⟨*lucida⟩
\ifcase\@lucidascale
\def\@LucidaFontShape#1#2#3#4#5#6#{%
  \DeclareFontShape{#1}{#2}{#3}{#4}{%
  <-5.5>s*[1.04]#5%
  <5.5-6.5>s*[1.02]#5%
  <6.5-7.5>s*[.99]#5%
  <7.5-8.5>s*[.97]#5%
  <8.5-9.5>s*[.96]#5%
  <9.5-10.5>s*[.95]#5%
  <10.5-11.5>s*[.94]#5%
  <11.5-13>s*[.93]#5%
  <13-15.5>s*[.92]#5%
  <15.5-18.5>s*[.91]#5%
  <18.5-22.5>s*[.9]#5%
  <22.5->s*[.89]#5}{#6}}%
  \or
\def\@LucidaFontShape#1#2#3#4#5#6{%
  \DeclareFontShape{#1}{#2}{#3}{#4}{%
  <-5.5>s*[.98]#5%
  <5.5-6.5>s*[.96]#5%
  <6.5-7.5>s*[.94]#5%
  <7.5-8.5>s*[.92]#5%
  <8.5-9.5>s*[.91]#5%
  <9.5-10.5>s*[.9]#5%
  <10.5-11.5>s*[.89]#5%
  <11.5-13>s*[.88]#5%
  <13-15.5>s*[.87]#5%
  <15.5-18.5>s*[.86]#5%
  <18.5-22.5>s*[.85]#5%
  <22.5->s*[.84]#5}{#6}}%
  \or
\def\@LucidaFontShape#1#2#3#4#5#6{%
 \DeclareFontShape{#1}{#2}{#3}{#4}{<->#5}{#6}}
\fi
```

We have to add `\noaccents@` to the setup for the LY1 encoding. Since there is no interface for doing this, we have to redeclare the encoding (and should not forget to redeclare the default font as well, otherwise NFSS will complain about `LY1/cmr/m/n`).

```
\DeclareFontEncoding{LY1}{}{\noaccents@}
\DeclareFontSubstitution{LY1}{hlh}{m}{n}
\DeclareSymbolFont{operators}      {LY1}{hlh}{m}{n}
\SetSymbolFont     {operators}{bold}{LY1}{hlh}{b}{n}
\DeclareSymbolFontAlphabet{\mathrm}{operators}
```

```
⟨lucidexp⟩ \SetSymbolFont{symbols}{normal}{MC}{lc}{m}{\@lucidaitshape}
⟨!lucidexp⟩\SetSymbolFont{symbols}{normal}{MC}{lc}{m}{n}
\SetSymbolFont    {letters}      {normal}{MSP}{lc}{m}{n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{lc}{m}{n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{lc}{m}{n}
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{lc}{m}{n}
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{lc}{m}{n}% missing font

⟨*lucidexp⟩
\SetSymbolFont    {symbols}      {bold}  {MC} {lc}{b}{\@lucidaitshape}
\SetSymbolFont    {largesymbols} {bold}  {MXP}{lc}{b}{n}
\SetSymbolFont    {letters}      {bold}  {MSP}{lc}{b}{n}
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{lc}{b}{n}
\ProvideSymbolFont{symbolsc}     {bold}  {MS2}{lc}{b}{n}
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{lc}{b}{n}% missing font
⟨/lucidexp⟩
⟨/lucida⟩
```

6.7 The MathTime layout

We provide two `mfd` files for Lucida, `mathtime.mfd` and `mathplus.mfd`, for the use without or with the MathTime Plus fonts.

```
⟨*mathtime⟩
\DeclareSymbolFont{operators}       {T1}{ptm}{m}{n}
\SetSymbolFont    {operators}{bold} {T1}{ptm}{b}{n}
\DeclareSymbolFontAlphabet{\mathrm}{operators}

\SetSymbolFont    {symbols}      {normal}{MC} {mt}{m}{n}
\SetSymbolFont    {largesymbols} {normal}{MXP}{mt}{m}{n}
\SetSymbolFont    {letters}      {normal}{MSP}{mt}{m}{n}
\ProvideSymbolFont{symbolsb}     {normal}{MS1}{mt}{m}{n}% missing font
\ProvideSymbolFont{symbolsc}     {normal}{MS2}{mt}{m}{n}% missing font
\ProvideSymbolFont{largesymbolsb}{normal}{MX1}{mt}{m}{n}% missing font

⟨*mathplus⟩
\DeclareMathVersion{heavy}
\SetSymbolFont    {operators}{heavy}{T1}{ptm}{b}{n}

\SetSymbolFont    {symbols}      {bold}  {MC} {mt}{b}{n}
\SetSymbolFont    {largesymbols} {bold}  {MXP}{mt}{b}{n}
\SetSymbolFont    {letters}      {bold}  {MSP}{mt}{b}{n}
\ProvideSymbolFont{symbolsb}     {bold}  {MS1}{mt}{b}{n}% missing font
\ProvideSymbolFont{symbolsc}     {bold}  {MS2}{mt}{b}{n}% missing font
\ProvideSymbolFont{largesymbolsb}{bold}  {MX1}{mt}{b}{n}% missing font

\SetSymbolFont    {symbols}      {heavy} {MC} {mt}{ub}{n}
\SetSymbolFont    {largesymbols} {heavy} {MXP}{mt}{ub}{n}
\SetSymbolFont    {letters}      {heavy} {MSP}{mt}{ub}{n}
\ProvideSymbolFont{symbolsb}     {heavy} {MS1}{mt}{ub}{n}% missing font
\ProvideSymbolFont{symbolsc}     {heavy} {MS2}{mt}{ub}{n}% missing font
\ProvideSymbolFont{largesymbolsb}{heavy} {MX1}{mt}{ub}{n}% missing font
⟨/mathplus⟩
```

The following values are taken from the `mathtime` package.

```
\def\defaultscriptratio{.76}
\def\defaultscriptscriptratio{.6}
\DeclareMathSizes{5}     {6}   {6}  {6}
\DeclareMathSizes{6}     {6}   {6}  {6}
\DeclareMathSizes{7}     {6.8} {6}  {6}
\DeclareMathSizes{8}     {8}   {6.8}{6}
\DeclareMathSizes{9}     {9}   {7.6}{6}
\DeclareMathSizes{10}   {10}   {7.6}{6}
\DeclareMathSizes{10.95}{10.95}{7.6}{6}
\DeclareMathSizes{12}   {12}   {9}  {7}
\DeclareMathSizes{14.4} {14.4} {10} {8}
\DeclareMathSizes{17.28}{17.28}{12} {9}
\DeclareMathSizes{20.74}{20.74}{14.4}{10}
\DeclareMathSizes{24.88}{24.88}{17.28}{12}
```

The following value was provided by Ulrik Vieth.

```
\delimiterfactor=867
⟨/mathtime⟩
```

7 The `oldmath` package

For documents which rely on the old math setup, we provide an `oldmath` package which reverts everything to the old setup.

```
⟨*oldmath⟩
\ifx\M@layout\@undefined
\else
  \InputIfFileExists{fontmath.ltx}{%
\let\@new@math@setup\@undefined

\let\clubsuit\relax
\let\diamondsuit\relax
\let\heartsuit\relax
\let\spadesuit\relax
\let\triangleleft\relax
\let\triangleright\relax
\let\mathparagraph\relax
\let\mathsection\relax
}{\PackageError{oldmath}
               {Old math setup required}
               {Your LaTeX kernel has the new math setup built in\MessageBreak
                and no fontmath.ltx file for the old setup was found.}}
\fi
⟨/oldmath⟩
```